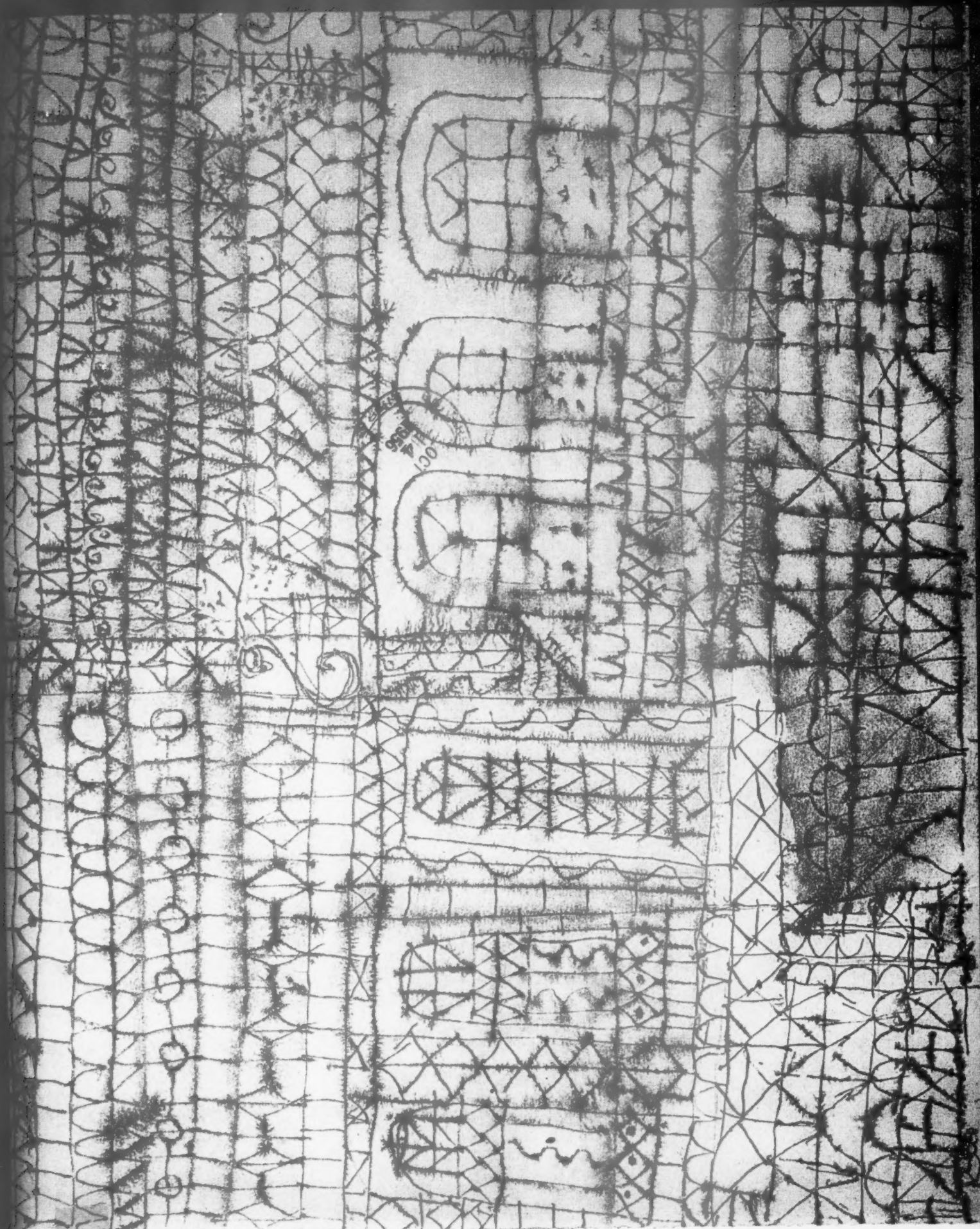




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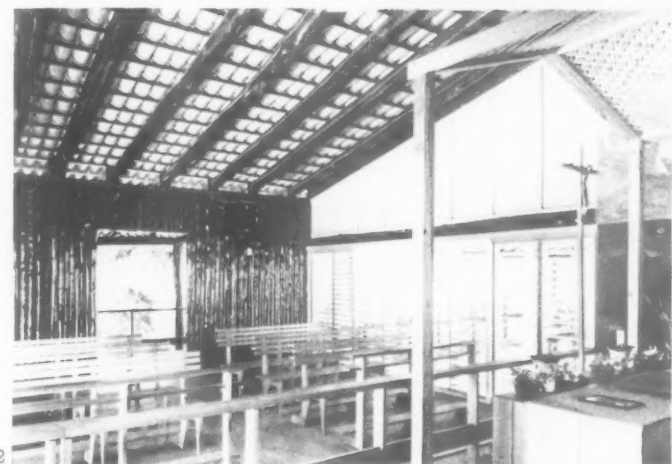
VICTORIA 4480

MARGINALIA

LOG CHURCH. A spirited mixture of ancient and modern, natural and manufactured materials has been employed by Francisco Bolonha for the Aecioly chapel in Petropolis, Brazil. Only the chancel walls are solidly built, and carry frescoes by Emeric Marcier. 1. The entrance wall is of untrimmed logs, with doors of the same material, as are the beams and rafters of the ceiling, whose structure is left exposed, revealing the underside of the tiled roof. The side walls, however, make sophisticated use of glass and louvred jalousies, whose precision is in strong contrast to the irregularities of the log-work, but is reflected by



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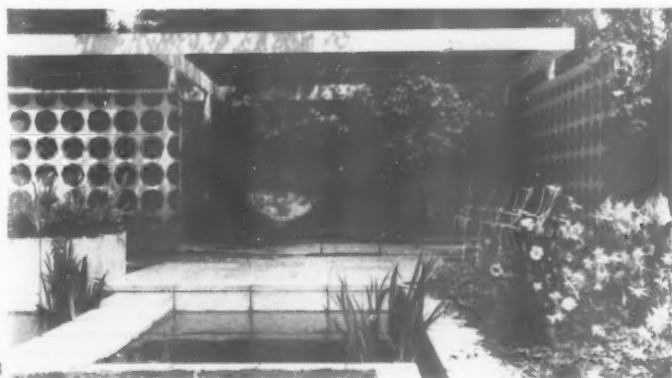


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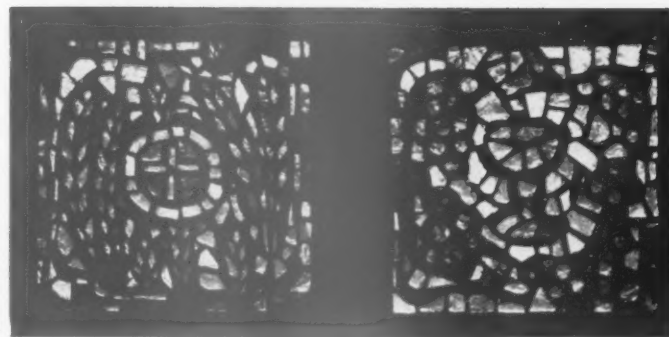
the pews (and other furnishings) which, indeed, set a standard of unaffected elegance that could well be emulated elsewhere. 2.

FLOWER - SHOW CONTEMPORARY. The Chelsea Flower Show has so long been the breeding-ground of that species of debased, fake-rustic, godwot-gardenesque that furnishes the agents of subtopia with some of their most cherished clichés, that the irruption of an alternative idiom of garden design is more than welcome. 3. When that alternative idiom is unabashedly contemporary and exhibits an air of professional accomplishment (to put it no higher) then the event must be chronicled for its value as a precedent,

as well as for its inherent merits. Cheal's, of Crawley, are to be congratulated for having commissioned a contemporary exhibit for the 1956 Chelsea show, and Derek Lovejoy for having responded with a design that uses the resources of the contemporary idiom in a manner that is unmistakably garden-like without concession to the accepted routines of formal and informal planning routines that have altered in nothing but an increasing flabbiness of design since the time of Gertrude Jekyll. Among the more interesting innovations of the Cheal-Lovejoy exhibit is the use of coloured panels that can be hung behind the pierced screens at seasons such as the winter when the average English garden is deficient in plant colours.



3



4

STAINED GLASS. The altar-windows of St. Peter's, Doversgreen, near Reigate, symbolizing the bread and wine of the Eucharist, have been executed in a new technique, using thick glass set in concrete. This new technique, which has been pioneered in this country by Whitefriars Studios, employs a faceted chipping of the glass surface to give more brilliant light effects and partly owing to the thickness of the glass, painting is not used, the pieces being self-coloured and carefully selected for tone and hue. 4.

CONTRACTOR-DESIGNED OFFICES. The new office-block for the Commissioners of Inland Revenue which is to be erected in Newington Causeway, 5, adjoining the LCC's



5

Elephant and Castle redevelopment, is an encouraging sign of improving standards in contractor-designed buildings. The contractors in question are Wates, and the building is the work of their chief staff architect, K. W. Bland. Construction is concrete-framed, the external cladding mainly glass, and completion is expected for early in 1957.

MANITOBA PERSPECTIVE. Another addition to the growing list of student publications that are too good to be brushed off as student publications is *perspective* 55, the fifth *perspective* to be published by the Students' Architectural Society of the University of Manitoba. The celebrity contributions are refreshingly off-the-beaten-track, featuring Yamasaki on *Visual Delight*, and Carl Koch on *Tomorrow's House*. The inevitable student contribution on thesis-passing is considerably more cynical than is the custom, the illustrations of student work particularly in basic design reveal a standard that is well up with Yale or North Carolina, and domes, hyperbolic paraboloids and sea-urchin structures abound.

LIVERPOOL OUTRAGE EXHIBITION. The Outrage issue of the REVIEW was kept deliberately non-architectural. But there is obviously a subtopian architecture to match the subtopian environment, and it was

in this sense that the Liverpool School of Architecture students attacked Liverpool's rebuilding in a recent exhibition which they also called 'Outrage.' It was held in the blitzed nave of St. Luke's church (itself due for a choice bit of subtopian rebuilding) under a steel-framed canopy designed by one of the students, Peter Foggo; and it was laid out and erected by the students without any help from the staff of the School. This left them free to say what they wanted; and they did this with such sincerity, and freedom from the traditional students-rag stupidity, that press and public alike were impressed. There was also the expected response-pattern of 'disgusting impertinence' from the architects whose work was displayed. It is doubtful whether it has come in time to do much to improve the quality of rebuilding in Liverpool, which is the worst in the country and was justly called 'Livermuddian' at the opening of the exhibition, but it has at least sown doubts in a lot of Merseyside minds.

CORRESPONDENCE

Subtopia

To the Editors,

SIRS, You might be interested to have positive evidence that the anti-subtopia campaign launched in your now famous 'Outrage' number has captured the imagination of the younger generation at school and university. The boys of the 'Architectural Hobby' here mounted their own exhibition under the title 'Local Subtopia' which is to be enlarged to a more comprehensive scale at local request. The new periodical *Oxford Opinion*, in its first issue, published an article on the theme under the heading 'The First Blast of the Trumpet' from its Oxford and Cambridge representatives. In a lighter mood - though what more effective than satire - the *Midnight Howlers* of St. Catharine's College, Cambridge, produced a number in a recent revue entitled 'Outrage' in which your Subtopia and Betjeman's suburbia shout at each other in counterpoint.

Yours, etc.,

W. J. STRACHAN.

[Editors' note: Mr. Strachan is the Headmaster of Bishop's Stortford College. In this issue we are publishing a *Toposcape Miscellany* note by one of his pupils, Christopher Hewett.]

Henry Moore Relief

To the Editors,

SIRS, I was happy to see a photograph of the wall-sized relief by Henry Moore in the March issue of the REVIEW, but would like to correct your statement that the wall appears different from the accepted model. The wall was executed by two bricklayers under my direct



Relief in carved brick at the Bouwcentrum, Rotterdam. See letter 'Henry Moore Relief'.

supervision, and is made exactly following the forms of the accepted project, which was seen at Henry Moore's last exhibition in London. We did not miss by half an inch! The photograph you published was taken at night; this one (above) will probably make the matter clearer.

Yours, etc.,

Rotterdam. J. W. C. BOKS.

Progress at Park Hill

To the Editors,

SIRS,—In the first quarter of the last century it was the practice of those Black Countrymen whom the Napoleonic wars had adequately enriched to move a few miles from their furnaces and settle in some more genial part of Staffordshire or Worcestershire. Subsequent wars and trade booms provided a succession of owners for their houses, owners usually with less taste than their predecessors, but who nevertheless embellished them with finer gardens and greenhouses, and, meantime, the lime trees and acacias matured.

After the greatest of all our wars there has followed a better peace than any that had preceded it. For there are now no profiteers (as there had been since the days of Elizabeth I and earlier) to make a display of elegance as well as riches. Instead, there are estate companies and public authorities.

The first picture shows a house of



this kind as it was during a period of some hundred and thirty years when it was known as Park Hill. A few years ago it was acquired under a compulsory purchase order and a

government department moved in. Coronation year was celebrated by the lopping of the avenue. Last year it spent ensnared in scaffolding. The second picture shows it as it now is, known far and wide as 'The Insurance' and 'reconditioned' accordingly. In the last few weeks a further improvement has been made; a shiny black asphalt roadway now replaces the old drive under the avenue.

Yours, etc.,

Birmingham. MILES HADFIELD.

Oxford Relieved

To the Editors,

SIRS,—It comes as no surprise that the REVIEW plan for Oxford is based primarily on Dr. Thomas Sharp's 'triumph of logic in town planning.' What is rather strange is the somewhat sketchy manner in which the plan is presented; there is a lack of sufficient detail which makes it difficult to form a true appraisal of its qualities. For example, what form is it proposed that the roundabout at St. Ebbe's should take? The small plan provided gives no real indication. There are also no suggestions made for the continuation westwards of the central road system, or siting of important new public buildings. Are we to assume that the plan follows Dr. Sharp's proposals in these matters? How, moreover, is it proposed that the High will reconcile its functions as 'Linear Forum' and 'Oxford's High Street'? It furthermore appears that one of the essential features of Dr. Sharp's plan—the relief road for Cornmarket Street—has no parallel in the REVIEW scheme. In spite of the relief of the High from arterial traffic, the Carfax bottleneck will still remain, at least, as far as north-south traffic is concerned. Cornmarket Street is twenty-five feet wide at its narrowest point; must it continue to function as a principal traffic road? In addition, the opportunity to develop a first-class shopping centre immediately behind Cornmarket Street, instead of in the less central St. Ebbe's district, will be lost unless a road similar to Dr. Sharp's Frewin Street is planned.

It is interesting to note that the Christ Church Meadow road follows the line of Dr. Sharp's alternative route, although he gave good reasons for preferring the northern Merton Field line. I rather doubt whether a road running fifty yards from Meadow Buildings will cause any great disturbance to their occupants, though the subterranean rumblings of the proposed tunnel might. However, the tunnel proposal has

much in its favour, although, rightly or wrongly, we seem to be prejudiced against tunnels in this country.

On one point all who care for Oxford must be agreed; your statement 'absolutely no compromise in planning terms is possible: better by far a continuance of the status quo and no solution at all.' In that way, at least, the dreadful botches recently contemplated by the Oxford City Council will be avoided.

Yours, etc.,

GEOFFREY NEWMAN.

Bournemouth.

[The Editors reply: We do not see that north-south through traffic passing through Cornmarket is an evil, as long as the entrance to the High at Carfax could be completely and permanently shut off. Congestion mostly occurs when cars turn right out of a road, or, naturally, where there is a crossing. There is not even any need then to have traffic lights at Carfax; pedestrians could cross by a bridge. It would seem logical enough to make the Corn the western boundary of the University precinct, as Worcester, the only college to the west of it, could not be included in a precinct any—y. Pembroke, which is also excluded, has an indestructible precinct of its own, together with St. Aldate's Church. We suggested in the article roughly scapping over the Union and the Market sites, to bring the Union into the centre. We agree with Mr. Newman, it is important to site the new shopping centre not about St. Ebbe's only but close to the Corn on the west. Why not a pedestrian market in the area at present occupied by the Union, and in the chaotic area on both sides of Queen Street (the street between Carfax and the County prison)? Must Sharp's Frewin Street, which is ruthless to an area which has plenty of charm, necessarily accompany such a scheme? And as for a road 50 yards from Meadow building, surely it would cause plenty of beastly disturbance; does a tunnel rumble quite as Mr. Newman says? Anyhow, the tunnel saves St. Aldate's and half the Meadow, and the entrance to it in the Meadow could be very nice.

It is true the AR plan is sketchy; it was meant to be a counterblast to the Oxford City Council's most recent piece of projected folly. We, and Sharp before us, tried to make a point that it was unnecessary to eviscerate Oxford with two roads, one north and one south, but that given the Meadow road on the south one could dispense with any road at all on the north. The retention of a north-south artery in the Corn makes it all the less necessary to fool about with northern relief roads.]

Litter

To the Editors,

SIRS,—I thought that you might like to see the enclosed photograph taken recently. My week-end hobby is walking, and I have been noticing the considerable increase in dumping of 'heavy' litter all over the countryside. A friend and I set off in his van to round up some of the fruitier specimens, and put them on record before taking them to our local council's refuse centre: with the exception of the meat safe, the milk crates and the oil stove, everything was found on National Trust ground; the bulk of it within fifteen yards of the signboard in the picture.

Twenty yards from the spot shown is an enormous pile of filth of every description; less than a quarter of a mile away (and still on Trust land) is another mound of refuse. What can be done? There is little hope of catching these vandals. Manifestly the stuff is brought down by car and while young Ernie keeps 'cave,' the



guy'nor heaves it overboard. Kent is rapidly becoming the dustbin of the suburbs even in winter time. God knows what will happen when the motoring season starts.

(The meat safe, lamps and milk crates were found in a by-lane near Hosey Hill, Westerham.)

Yours, etc.,

GORDON CATLING.

Sevenoaks, Kent.

Intelligence

The new architect to the LCC, in succession to Dr. Leslie Martin, is Mr. Hubert Bennett, hitherto county architect of the West Riding of Yorkshire.

Mr. Reynolds Stone has been appointed Royal Designer for Industry by the Council of the Royal Society of Arts.

The Daily Mail is organizing a competition for a £5,500 house, to be built at the Ideal Home Exhibition next year. Prizes are £500, £250 and £100. Further details of the competition from the Daily Mail.

The Fourth Biennial of the Sao Paulo Museum of Modern Art will take place from September to December, 1957, and will include an International Architectural Exhibition and International Contest for Schools of Architecture. Details of entry, etc., should be obtained from: Secretaria da Bienal do Museu de Arte de Sao Paulo, Rua 7 de Abril, 230, Sao Paulo, Brazil.

Corrigenda

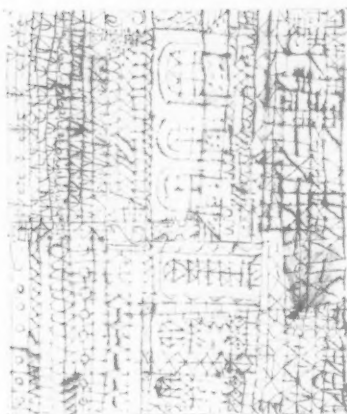
The Principal of Princeton school of architecture, Mr. Joseph Brown, wishes us to mention that the play equipment illustrated in Marginalia, December, 1955, was designed by himself and not by his students.

ACKNOWLEDGMENTS

MARGINALIA, pages 141-142: 1-2, A. Michel; 5, S. W. Newbery; Park Hill, M. Hadfield; litter, G. Catling. SCHOOL IN SOUTH KENSINGTON, pages 150-157: Galwey, Arphot. DERELICTION: 3, pages 158-163: 8, Galwey; rest, Browne, Arphot. ROCK-CUT TEMPLES, pages 164-167: Julian Huxley. FLATS IN RIO DE JANEIRO, pages 168-171: Aertsens Michel. GREAT OPEN SPACES, pages 172-176: Camera Press. POLAR SHELTERS: page 178, top, Jacques Musson. CURRENT ARCHITECTURE, pages 181-184: OFFICES IN CHISWELL STREET: J. R. Pantlin; HOUSE IN REIGATE: Norman Gold. MISCELLANY, pages 185-194: Exhibitions, 1, Ward Hunt; 2, Courtauld Inst.; 4, Gauvin; 6, P. E. C. Smith. This Is Tomorrow, all from exhibition catalogue, except 7, Richard Hamilton. Townscape, C. Hewett; Photography, J. Deakin. Islington Gardens, Galwey. Time Made Visible, 1, McCallum, Arphot; 2, John Piper. Topography, A. C. Cooper. Popular Art, Australian Dept. of the Interior. SKILL, Interiors, pages 195-196: Galwey. Design Review, pages 197-200: Glassware, Toomey, Arphot. Techniques, pages 201-208: 28, Bristol Aeroplane Co.; 32, Photographic News Agency.

THE ARCHITECTURAL REVIEW

Volume 120 Number 710 September 1956



The Cover is a drawing executed by Paul Klee in 1924, during his Bauhaus period. Its title is *Facade*, and although it clearly refers, in its capacity of a graphic sign, to an elevation of Victorian solidity, its spiderweb quality as a visual image, its sense of mobility of the parts and transparency to light, render it comparable to a class of architectural experience that only the most recent technical advances have made available in structural fact. It is one of the most prophetic, as well as witty, of the fantasies of Klee that are discussed by Robert Melville in the essay which opens this issue.

141 Marginalia

142 Correspondence

144 Frontispiece: Preview: Southampton University Engineering Building: Architect, Basil Spence.

145 Klee by Robert Melville Marked by discretion, economy and coolness, the architectural drawings of Paul Klee are—in his own words—built in a region beyond this world 'which can be all affirmation.' They are pure creations of the human will that attain decorative sumptuousness or define complex events by means of a thinking and dreaming line. They draw the affection of architects because they record and explore day dreams and ambiguous visualisations too fleeting to achieve tectonic permanence by other means; they are temporary houses for the spirit that adumbrate the mystery of entrances, the shifting and changing of facades. Though they are so small that they must be read, rather than viewed, they are still capable of enlargement without loss of quality, and Mr. Melville suggests that they might even be used, in the form of giant sky-signs, to re-assert architectural values in defiance of urban squalor.

150 School in South Kensington: Architects, Chamberlin, Powell and Bon.

J. M. Richards
Directing Nikolaus Pevsner
Editors H. de C. Hastings
Hugh Casson
Executive Editor Ian McCullum

Art Editor Gordon Cullen

Assistant Editors production, Ian Nairn.
research, S. Lang, literary, Reyner Banham. Editorial Secretary, Whi 0611-9

158 Dereliction: 3 by Kenneth Browne

The growing demand for sand and gravel to employ in concrete construction has led to the gathering of rings of pits and other workings close to our major centres of population. The closeness is a result of the economics of transporting such a cheap but bulky material, and the pits contribute much to the squalor of suburban blight. Some measure of control over such workings now exists, and there are codes of procedure for back-filling and making good when they have been worked out, but, as Mr. Browne points out in his article, though there are economic pressures, as well as amenity interests, that reinforce the rule of thumb tendency to put things back as they were, there are very good reasons also for leaving them open, simply because they are so close to congested central areas. This is particularly the case with water-logged pits which, with suitable grading of the banks and sympathetic planting, could (indeed, already do) provide a type of waterside amenity that is often hard to find in such areas.

164 Rock-cut Temples by Julian Huxley

Though the transference of wood-working forms to stone structures is a normal development in the history of most architectures, India appears to have had an unusual intermediate phase when such forms were carved into the living rock, rather than built up from the ground. Dr. Huxley describes a tour of some of India's most spectacular rock-cut sites, distinguishing those, like Ajanta, which are really verandahs excavated into cliff-faces, from those like the Seven Pagodas at Mahabalipuram and the Kailasha Temple at Ellora, which are monoliths left upstanding after a small hill or part of a ridge had been cut away from round them. The Kailasha temple, Dr. Huxley points out, bulks half as large again as the Parthenon, and is therefore probably the largest free-standing sculpture made by man.

168 Flats in Rio de Janeiro: Architect, Jorge Moreira

172 Great Open Spaces by Roger Johnson

Sprawling new mushroom townships are not peculiar to the Western Hemisphere, and many of them have grown up lately on the scrublands and prairies of the British Commonwealth. There they tend to exhibit one of the besetting vices of post-war town planning in the Home Country—prairie planning—and yet the factor which makes this possible—an open, empty countryside—is also the one that renders it noxious. With the vast emptiness outside, there is even more need for a close-textured urbanity within. Yet the air photographs of Nairobi, one of the newest Commonwealth capitals, on which Mr. Johnson comments in his article, show empty acres of scrub locked up within the city limits by abstract, Beaux-Arts, paper-planning. But these half-developed areas do offer one hope, in that they still leave room to create a more humane urban landscape as they are filled up.

177 Polar Shelters The polar shelter units designed by ATBAT constitute a valuable contribution to radical thinking about problems of house structure. Intended for the French antarctic research party in World Geophysical Year, 1956-7 (though they will not now be used) they employed aircraft design and assembly techniques (see also pp. 177-180) to provide accommodation in which all members of the party would have been able to work at maximum efficiency, and relax in complete security.

181 Current Architecture

Miscellany

185 Exhibitions

188 Townscape

188 Photography

189 Outrage

190 History

191 Topography

192 Popular Art

193 Books

Skill

195 Interiors: Showroom in Mount Street, W.1: Designer, Nigel Walters.

197 Design Review

201 Techniques: Aircraft and Building

by Christopher Dawson Over the last decade the building industry at large, as well as the architectural profession, has become increasingly interested in methods and materials developed by other industries, and many new techniques of design and erection (as with the ATBAT project, pp. 177-180) have been taken over from industries where scientific research is accepted as of fundamental importance. The aircraft industry is one of these, and Mr. Dawson, by examining contracting, designing, testing and assembly procedures employed in aircraft construction, is able to show those areas of methodology which lie closest to those of building, and those which, though remote, may still have lessons to teach.

208 The Industry 210 Contractors, etc.

Author: Roger Johnson. Born 1922, trained as architect, Liverpool, interrupted by 4 years' war service as F.A.A. Pilot; P.O.W. Last 5 years in Kenya, Uganda and the Cape. E. African work included a residence for the Aga Khan at Dar-es-Salaam. At present lecturing at Cape Town University. Recently held first one-man show of paintings—mainly abstract.

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THE ARCHITECTURAL REVIEW

9-13 Queen Anne's Gate, Westminster, SW 1 • Whitehall 0611

FIVE SHILLINGS



While so much recent University Architecture in Britain has failed to answer to our traditional standards of design for such work, the new Engineering building for Southampton is true to the standards of both Engineering practice and the University ideal. Designed by Basil Spence and Partners, it will house lecture rooms, studies and laboratories, and the main lecture hall—as will be seen in Kenneth Browne's impression, opposite —cantilevers dramatically forward to form a porte-cochère over the entrance. The tall building beyond is a possible extension for the Engineering Department and has its floor-slabs cantilevered out from a central core which also houses services.

Robert Melville

KLEE

PAUL KLEE'S ARCHITECTURAL MIRAGES

The architectural fantasies of Paul Klee must surely hold a very special place in the affection of architects, for they can be read as intimate and precise records of the day-dreams and ambiguous visualizations which arise unbidden when the mind plays with the potentialities of the new architectural concepts. Caroline Giedion-Welcker, in her eloquent study of Klee's development, remarks that 'his interpretation of architectural motifs is not tied down by static masses but moves freely in all directions. His domes and cathedrals, his round and pointed arches, his window-frames and crossbars are tissues which impart to the composition a geometric yet alive-and-growing appearance'. Movement and transparency are its ruling principles. (See cover of this issue.)

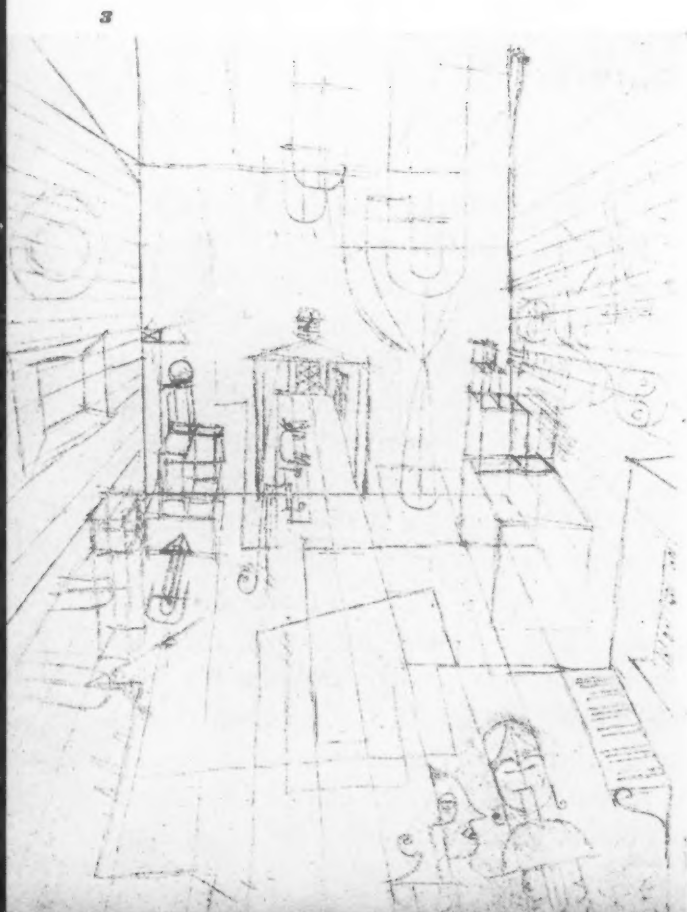
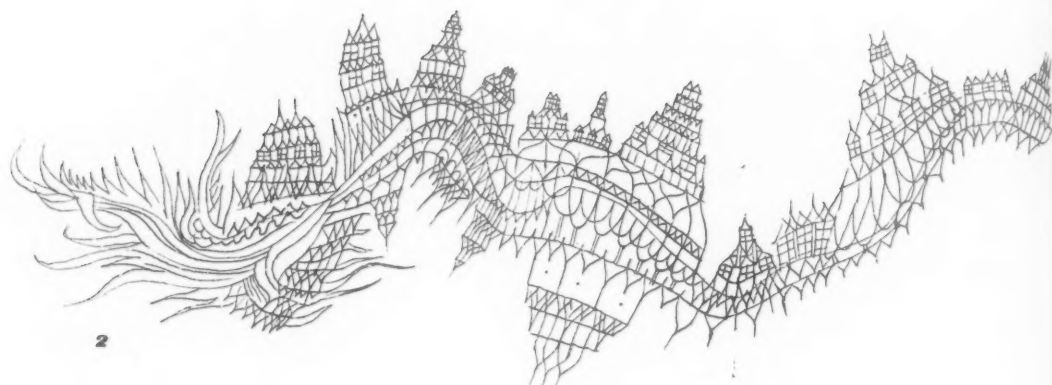
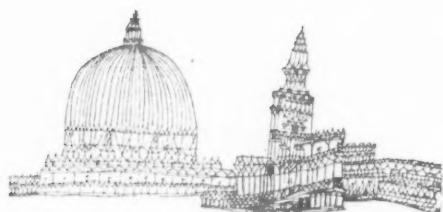
The economy, discretion and coolness of his romantic vision make one wonder if it is right to call his drawings fantasies, but they conform to an approved definition in that they are a 'making visible', and, in an age which is very properly suspicious of embellishment yet distressed by its absence, the frugality with which he obtains decorative sumptuousness or defines complex events is a highly acceptable magic. In 'Flood Swamps Cities', 2, the force of the flood is established by the waver, the Northern meander, in the line of palaces; and it is impossible to imagine a more succinct rendering of the coming on of a catastrophic event than his drawing of a steamboat approaching a waterfall, 9. The lifting lines behind the boat push it inexorably to its doom, and one cannot doubt that Klee's concision, gravity and wit prepared the way for the dispassionateness that characterizes the graphic humour of the present day.

It is appropriate that 'another world' should be witnessing—with the trace of a frown and a slight pursing of the mouth—the impending fate of the little boat, for Klee thought in terms of forces and cosmic play, and an entry in his diary explains his point of view. 'The heart that beat for this world,' he wrote—in 1915—'has been almost extinguished in me. It is as though my only bond with "these" things were memory. . . One relinquishes this world and builds into a region beyond, which can be all affirmation.' It is probably no accident that two years before Klee made this entry in his diary

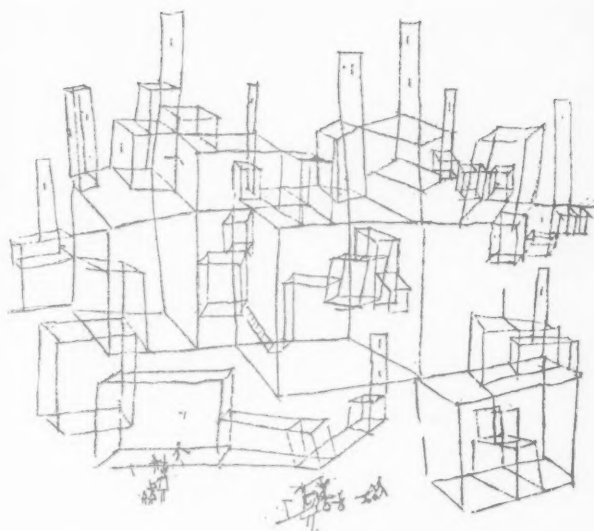
[continued on page 149]

PAUL KLEE'S ARCHITECTURAL MIRAGES

Klee wrote in his Pedagogical Sketchbook: 'In the world of physical reality every ascent must be followed by a descent. . . . The physical curve thus ends as a perpendicular line. . . . In contrast, a cosmic curve frees itself more and more from the earth in infinite motion, to fulfil itself freely in a circle or at least an ellipse.' Klee really preferred straight, articulated lines to circles and ellipses, but he wanted to 'return to earth' with cosmic freedom. He sought infinite movement with a maximum of variety; an angular art with a serpentine progression. 1, The Big Dome, 1927. 2, Flood Swamps Cities, 1927. 3, Room Perspective with Inhabitants, 1921; a room making straight for the horizon. To quote from the



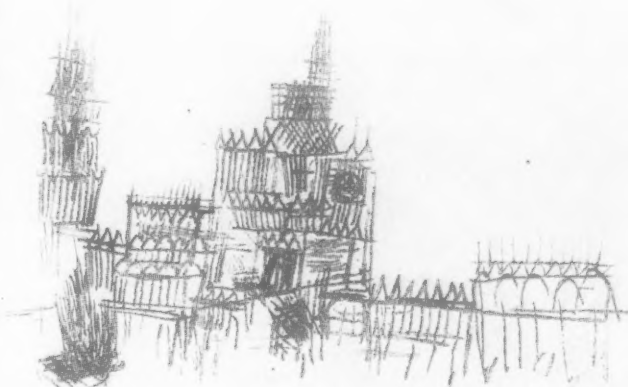
Pedagogical Sketchbook again, 'the direction of the movement manifests itself so forcefully that the ambiguous symbol (arrow) may be eliminated.' 4, View of an Ancient City, 1927; in contrast to 8, this is tentative movement; a city feels its way cautiously into space. 5, Dutch Cathedral, 1927. 6, City with Watch-Towers, 1929. 7, City in Sunlight, 1927. Klee said: 'The legend of the childishness of my drawing must have originated in those linear compositions. . . where I have tried to combine a concrete image with its representation through the use of the pure linear element.' The pure linear element is the line in action, pursuing its own course, moving along a thousand new angles of approach, arriving at a thousand unexpected destinations.



5



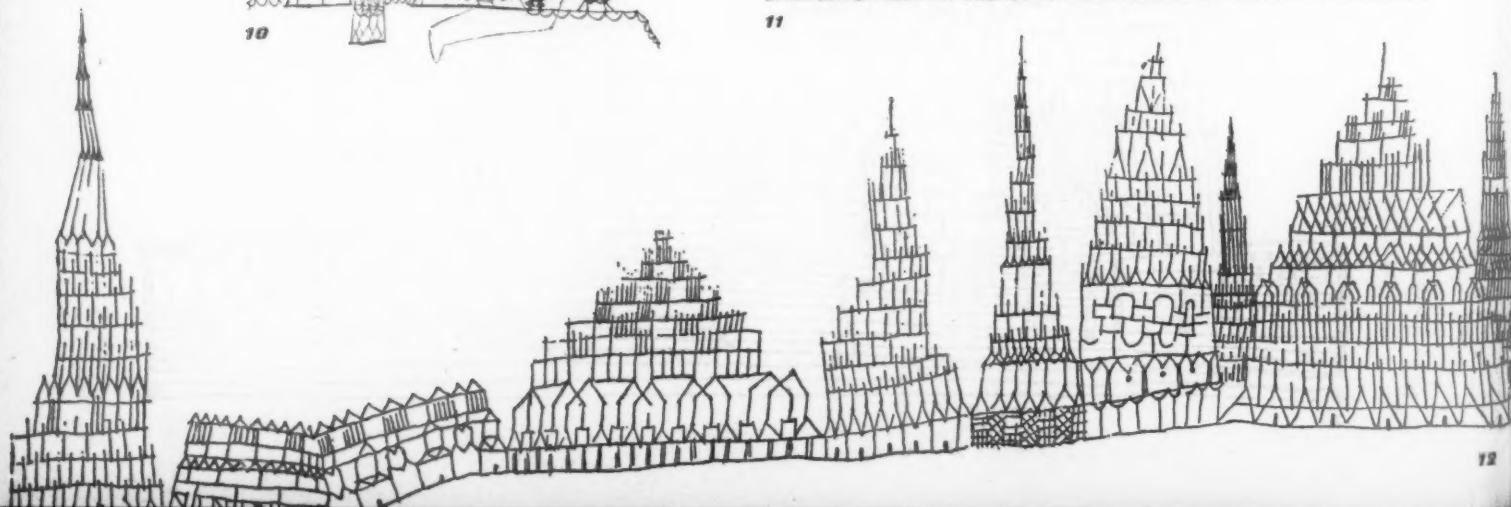
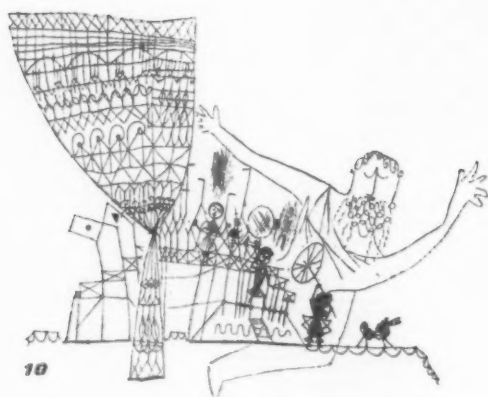
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7

PAUL KLEE'S ARCHITECTURAL MIRAGES

8, Building the Monument, 1929. Fortunately, the monument was never completed, and the beautiful ladders climb its visage to this day. 9, Waterfall and Full Moon, 1928. 10, Before and Behind the Bridge, 1928. 11, Site for a Theatre, 1928. 12, Town of Cathedrals, 1927. The line that Klee took for a walk is like a moody arrow, always changing the lengths and angle-degrees of its head and its tail-feathers: rising, falling, wavering, swerving, it somehow manages to get 'a bit farther than customary.'



[continued from page 145]

Giorgio de Chirico, whose early paintings have an equally poetic and magical content, was apostrophizing an art 'without love' in which 'the creation appeared more extraordinary than the creators', and with this attitude of Klee and Chirico in mind it occurs to me that we do not mean what we say when we appeal for some sign of human warmth in contemporary architecture, but that we seek something that remains 'pure' yet contains more than a hint of the Palace of Illusion.

Klee's stay in the Tunisian walled city of Kairuan in 1914 and his visit to Egypt in 1928 left their mark on many of his architectural fantasies, but his palaces and cities seem more to the east than Kairuan and deeper in time than Egypt. All the same, there is nothing obsessively 'Eastern' about his motifs; he is the least obsessed of twentieth-century artists and explored with passionate disinterestedness every avenue which opened up before him, and whatever geographical associations—near or far—his drawings may arouse, they are always at that distant point that separates dreams from actuality, and if there were some way of giving his motifs three dimensions they would still be remote, not necessarily in style, but essentially in spirit; and I take that to be the secret aim of every architect.

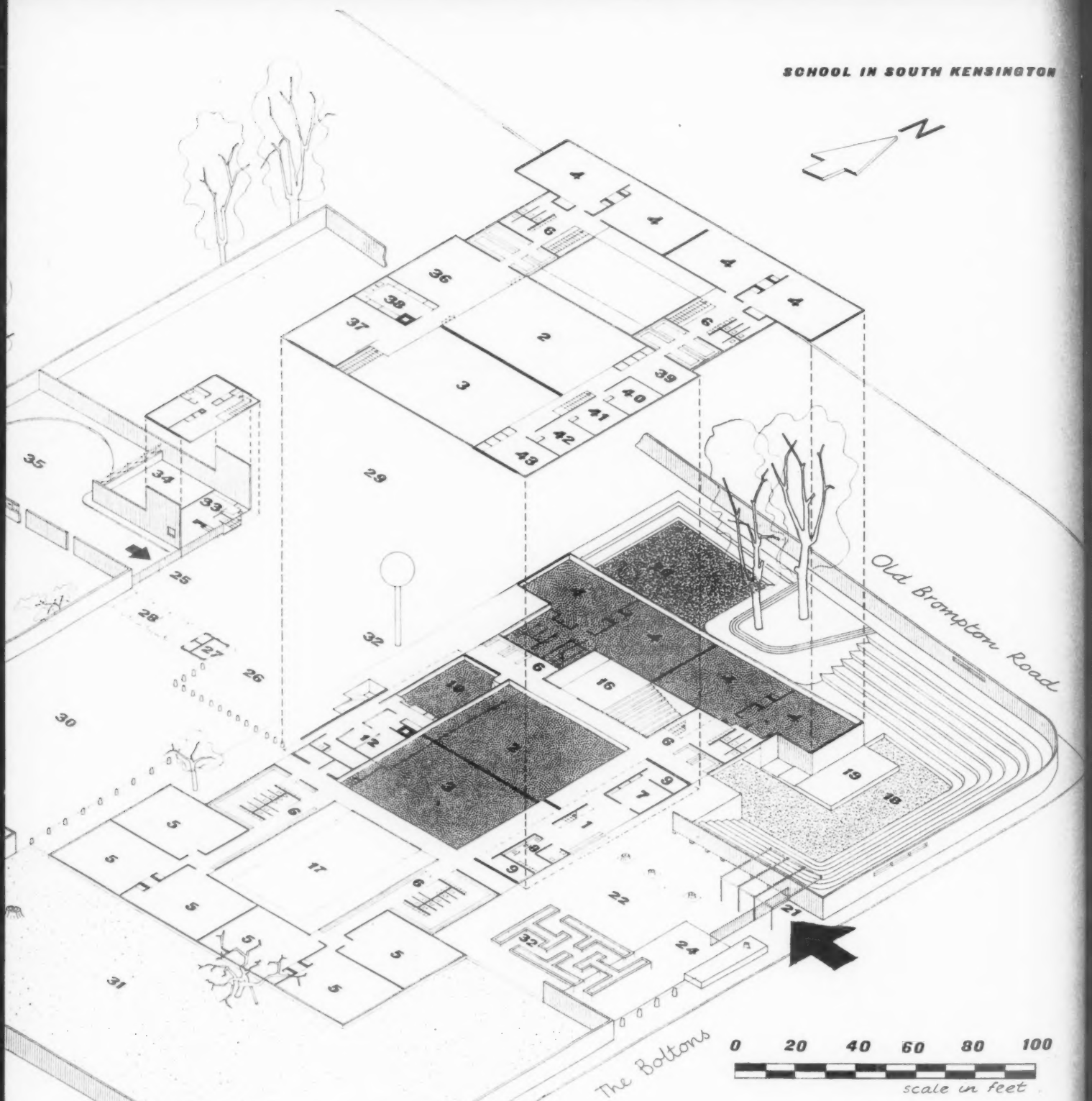
There are drawings by Klee which inevitably bring to mind Coleridge's stately pleasure domes, and others which recall Rimbaud's boroughs where legends are born. On the other hand, although it is usual in discussions of Reg Butler's colossal project for a monument to the Unknown Political Prisoner to mention some drawings made by Picasso in 1927, for a monument 'to be built on mountains overlooking the Riviera', a painting by Klee made in 1921, called 'Building the Monument', is more truly a predecessor, and its lovely configuration of spidery ladders at many levels expresses the same Gothic spirit, 8.

Everything he drew was an open book demanding to be read rather than viewed, since it is usually of a reticence or smallness that does not tell at a distance, but his art is in no sense literary: it is what he himself called 'form-thinking'. His concept of the thinking and dreaming line bears a subtle, utterly adult relationship to the child's desire to put a line round its 'think', but whereas a child's drawing is pre-representational, the absence of imitation in a drawing by Klee is post-representational. The spontaneity of his graphic explorations is sustained by a coherent and highly developed sign-language that casts its net beyond what is visible to the eye.

He thinks of architecture as an art of making temporary houses for the spirit, and he has given profound consideration to the mystery of entrances, the shift and change and Heraclitean flow of the façade, to town planning and landscape gardening, to filled and empty space, to maximums of variety and standardization, and no architect could fail to respond to 'Room Perspective with Occupants' and the artist's solution for dealing with the tiresome factor of people, 3.

The drawings are usually black on white, but it is easy to think of them as white on black for they are appearances playing against the dark, and I have seen them scaled up well beyond their original size without loss of quality. These facts, and memories of the fantasy that burst upon the London scene in the never-to-be-forgotten year of the Festival of Britain, lead me to propose that a neon sign rendering a vastly magnified image of the drawing called 'Town of Cathedrals', 12, should be fixed to some Thames-side buildings: it would provide a night spectacle of unearthly loveliness and humour, and be our silent, hopeless protest as the office blocks in the City cast longer and darker shadows.

SCHOOL IN SOUTH KENSINGTON



key

white areas indicate inhabited space

- | | |
|---|---|
| 1. entrance lobby. | 22. entrance forecourt. |
| 2. junior hall. | 23. formal flower beds. |
| 3. infant hall. | 24. pool. |
| 4. junior classroom. | 25. service entrance. |
| 5. infant classroom. | 26. paved turn-around above fuel bunkers. |
| 6. cloakrooms, lavatories and circulation. | 27. store for refuse bins, etc. |
| 7. medical inspection room. | 28. playground shelter. |
| 8. staff lavatories. | 29. junior playground. |
| 9. store. | 30. infant playground. |
| 10. kitchen. | 31. garden. |
| 11. kitchen supervisor. | 32. spherical water tank. |
| 12. kitchen stores. | 33. schoolkeeper's house. |
| 13. kitchen staff-room. | 34. schoolkeeper's garden. |
| 14. schoolkeeper's office. | 35. turn-around. |
| 15. stairs down to boiler room. | 36. junior dining. |
| 16. junior enclosed court with stairs down to link with amphitheatre. | 37. infant dining. |
| 17. enclosed infant courtyard. | 38. servery. |
| 18. amphitheatre. | 39. junior staff-room. |
| 19. amphitheatre stage. | 40. junior head teacher. |
| 20. sunken court. | 41. secretary. |
| 21. main entrance gate. | 42. infant head teacher. |
| | 43. infant staff-room. |

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SCHOOL IN SOUTH KENSINGTON

ARCHITECTS
Assistant-in-Charge

CHAMBERLIN, POWELL AND BON
George Agabeg

1, main entrance, with staff rooms over, seen from amphitheatre.

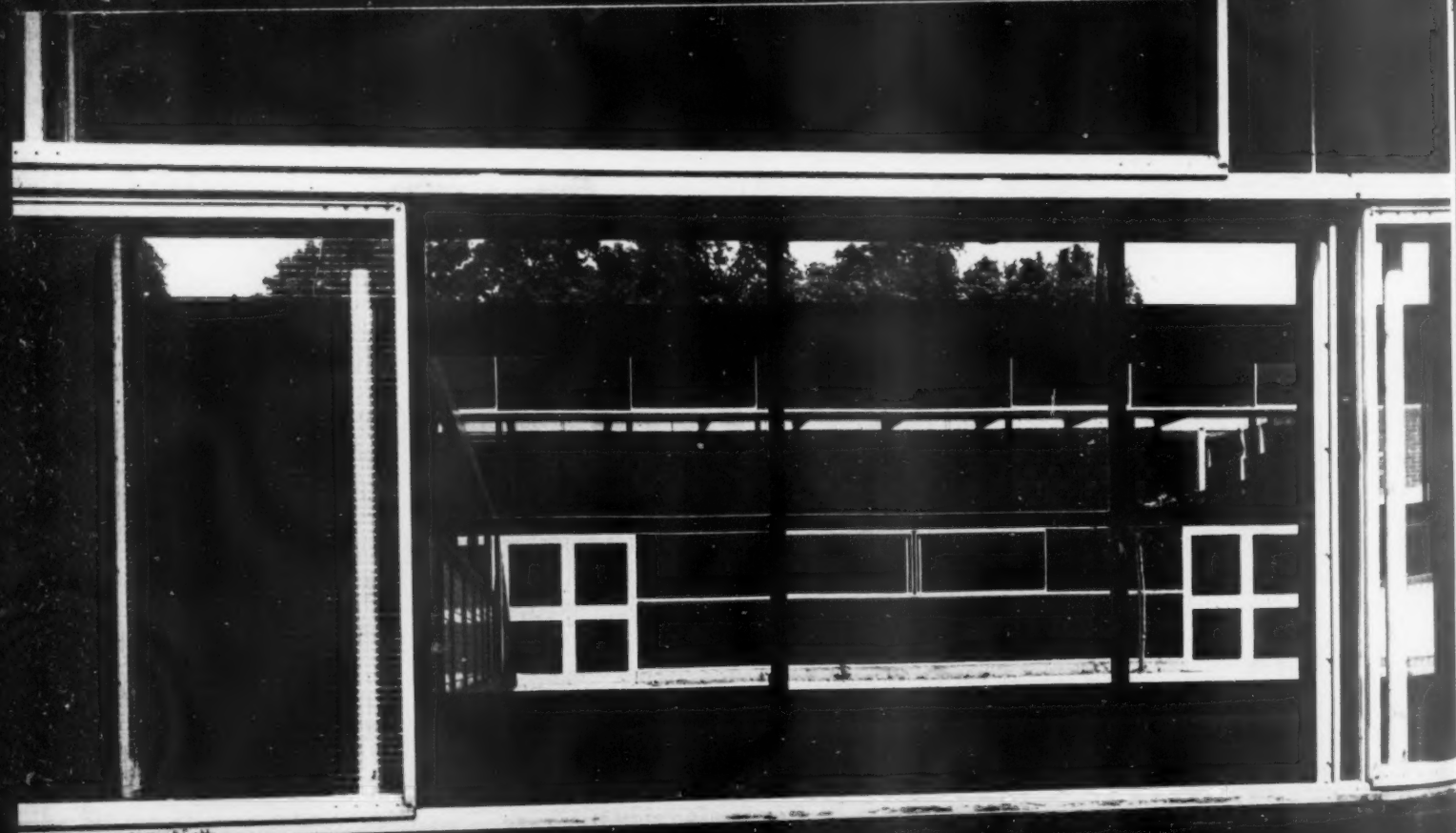
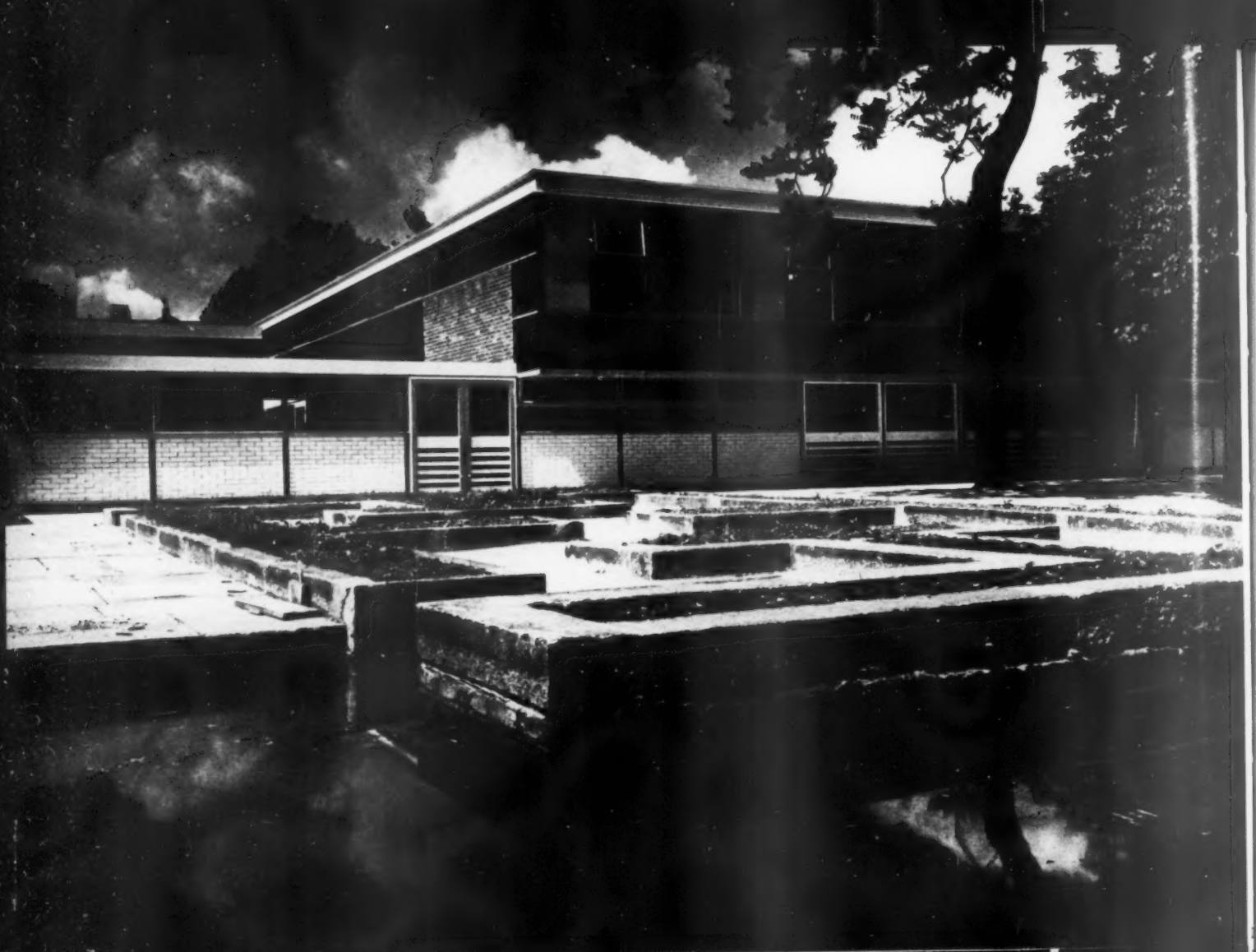


Bousfield School* has three features of particular interest: firstly, it is designed on a modular basis;

secondly, the building is largely prefabricated; and thirdly, the structural frame and the external cladding are closely integrated. Furthermore, the structural steel frame is left exposed, a departure from the normal

*Situating on the corner (west side) of Old Brompton Road and The Boltons.

[continued on page 153]



continued from page 151

practice in London which is dictated by fire regulations. As an educational building, this did not have to comply with local authority bye-laws and when the design came before the LCC, this feature was allowed on the grounds that it was experimental.

The module adopted is 40in.; all the rooms are laid out as multiples of the module, usually measured to centre lines of partition walls or of the frame; on the perimeter of the building, structural mullions are set out at a distance of two modules between centres. In elevation the major divisions reading vertically occur at distances apart of one module, two modules and half a module. These divisions conveniently fit in with the internal floor-ceiling heights (classrooms being about 9ft. high and circulation areas, etc., about 7ft. high). Other dimensional divisions of the module employed in the design are limited to multiples of 5in., i.e., one-eighth of a module.

Apart from the concrete substructure, brickwork and plastering of brick walls, nearly all the construction is dry. The steel frame, aluminium and glass cladding, wood-wool roof panels and all joinery were prefabricated, thus only requiring assembly on the site. Instead of making the structural frame largely independent of the window frames or curtain walling, very close integration of the structural frame with the external cladding has been achieved.

The houses that formerly stood on the site facing Old Brompton Road and those south of South Bolton Gardens (a minor road that used to bisect the school site which has now been closed and built over) were bombed during the war. In general the site is open and many trees have remained in the gardens of the destroyed houses. The building was conceived as a pavilion in a garden. The main entrance from The Boltons is approached through a forecourt in which the main entrance gates, flanking walls, decorative pool and flower beds are grouped in a formal composition; in contrast to the rest of the site which is enclosed by boundary walls, the entrance forecourt is only separated from the street by the low entrance gates and the moat formed by the decorative pool. To the south is the garden which the infants' classrooms overlook. To the west are the playgrounds, and an amphitheatre has been formed in an old static water tank at the north-east corner of the junior block. As many trees as possible have been preserved and their relationship to the buildings and the paved areas has been carefully considered.

The school is designed to accommodate 560 children in two departments, one for juniors and one for infants. The large communal elements are grouped in the middle: the two assembly halls are side by side; a gallery for dining is planned above the kitchens at the west end; the staff rooms are grouped on another gallery overlooking the halls at the east end. The eight junior classrooms are planned in a two-storey block linked to the

junior hall by two wings containing lavatory and cloak-room accommodation, thus enclosing a small court from which steps lead down to a way through linking with the amphitheatre. Similarly, the six infant classrooms



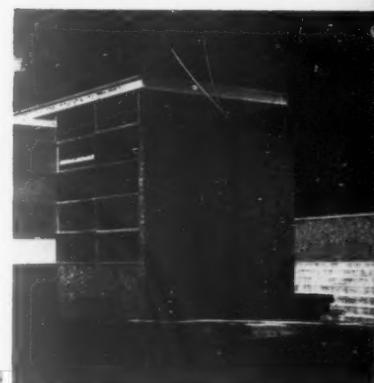
SCHOOL IN SOUTH KENSINGTON



4, N.W. corner of infants' enclosed courtyard, 5, west side of central core and spherical water tank, painted bright yellow. 6, east end of junior classroom block, forming backcloth



Opposite, the pool of water 2, provides an entrance hazard making possible a light, low railing and giving reflections which are echoed in the school's glass walls. 3, the infants' assembly hall seen across a courtyard, shows the sense of ambiguity provided by varying the intensities of light from garden to courtyard to the darker sky-lit back wall of the assembly hall.

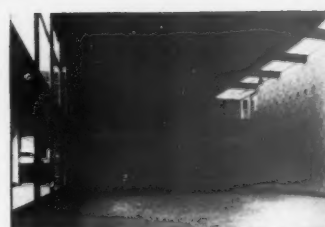


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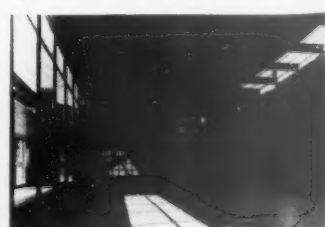


7

to amphitheatre stage, as seen through the eye-level viewing slit in the outer wall. 7, main entrance from the south-east.



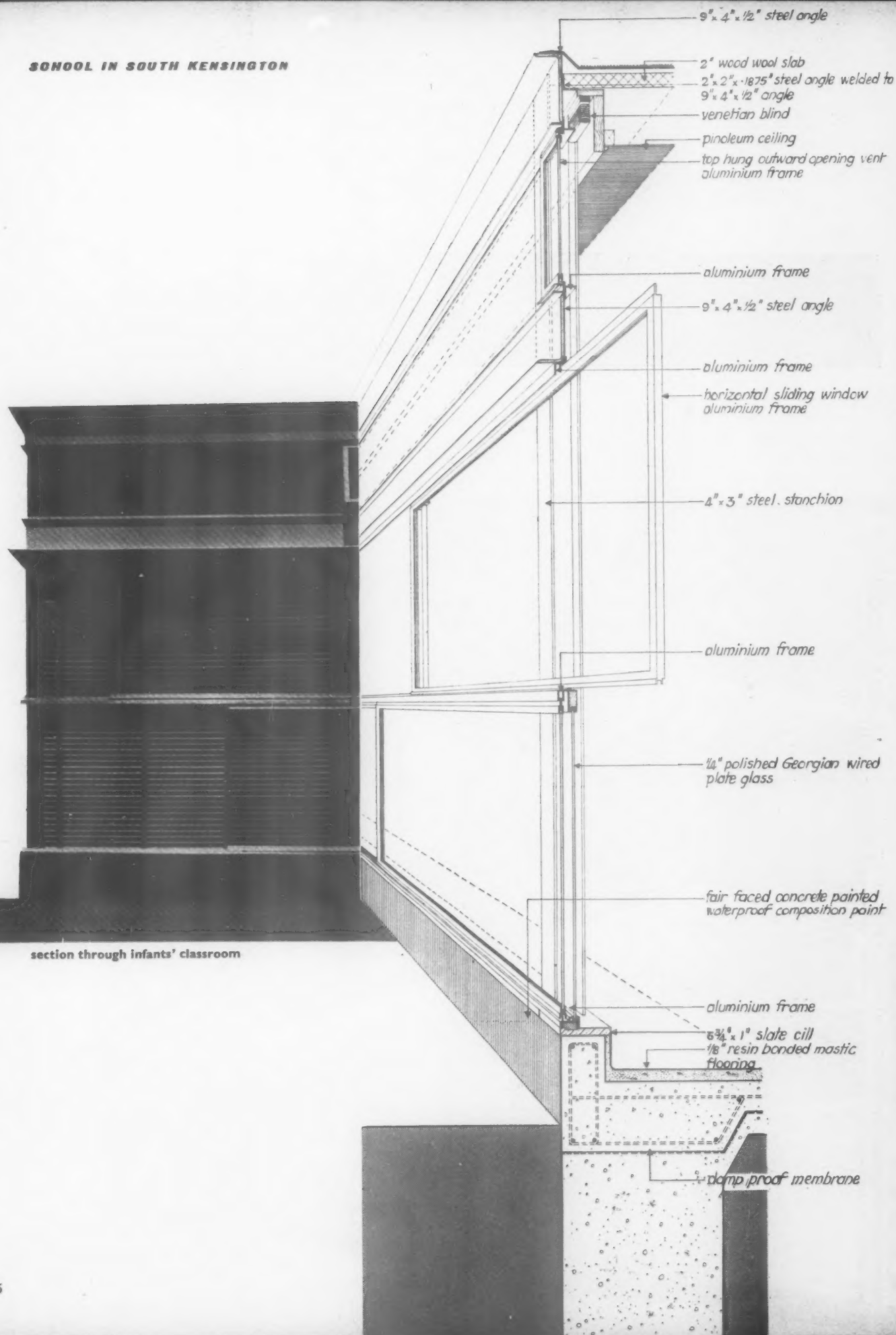
8 and 9, infants' assembly hall from opposite ends: wallpaper black with white flecks, ceiling of corridor green, 10 and 12, a similar pair of



views of the junior hall: wallpaper white with black flecks, 11, as 9, but taken from ground-floor level.



SCHOOL IN SOUTH KENSINGTON

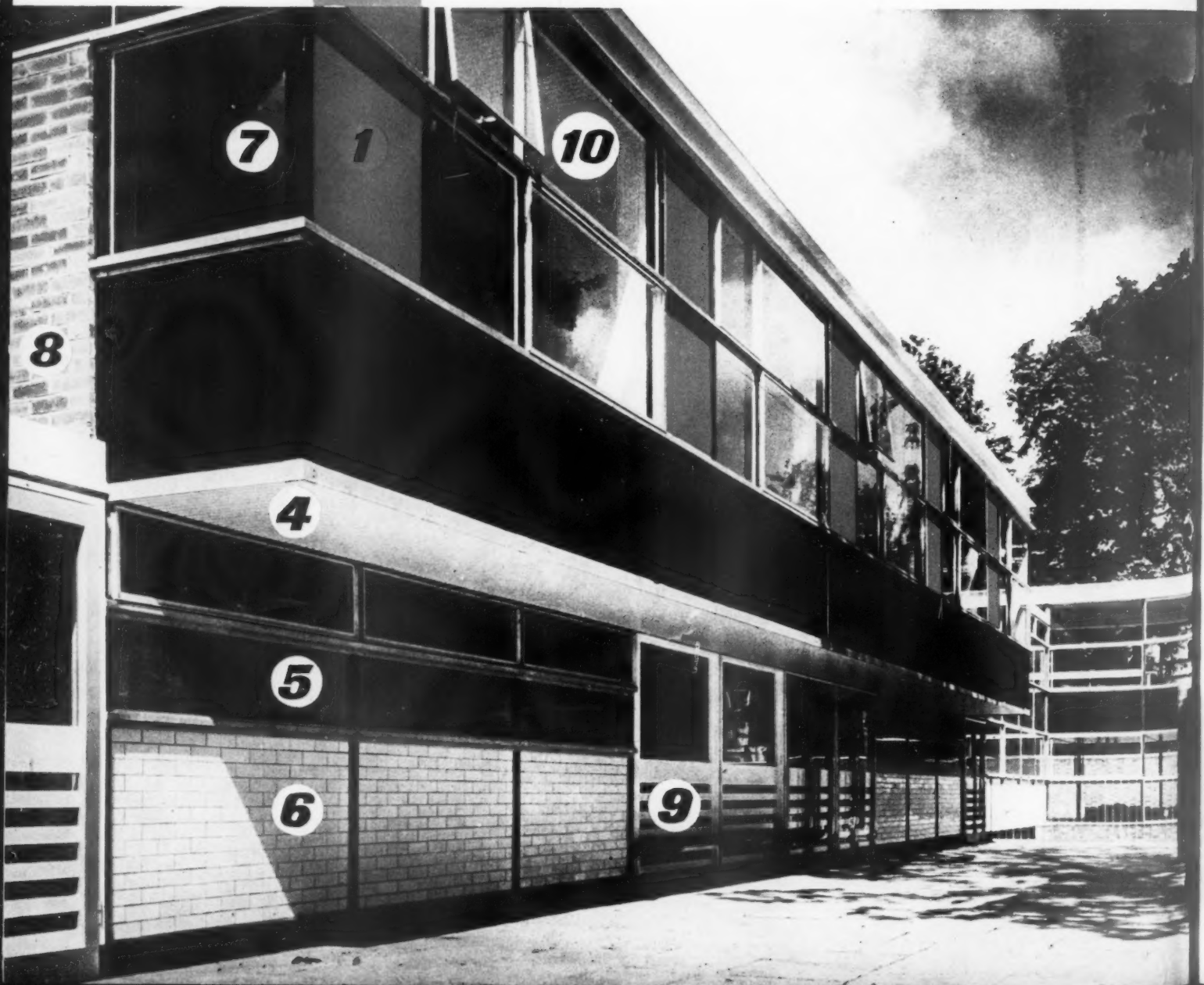


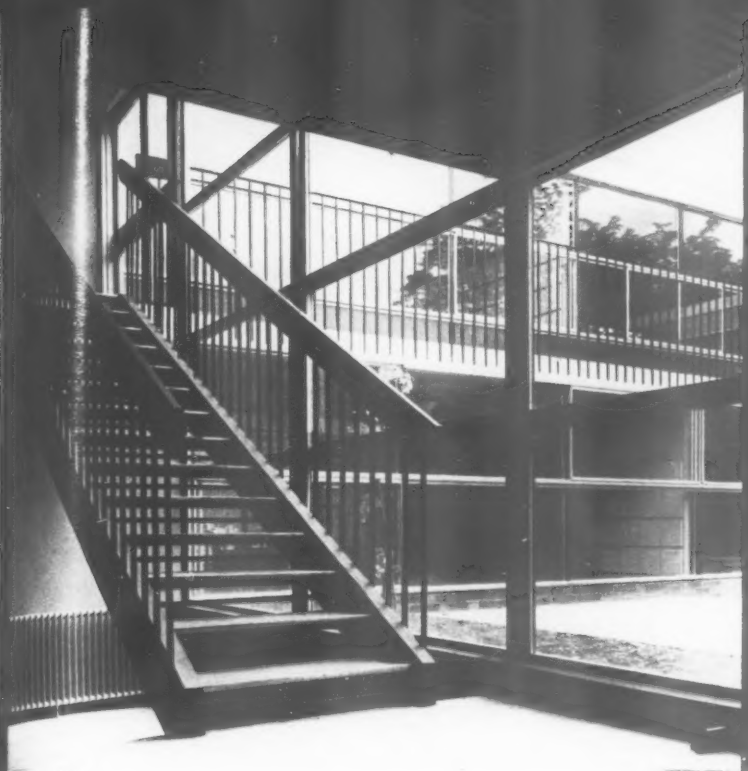
section through infants' classroom

The colours of the building, brickwork, steel, woodwork and panelling are indicated on the list, right, which is keyed to the photograph below.

On the left is a diagram showing how the arrangement of the coloured glass panels imitates the natural mixing of blue and yellow.

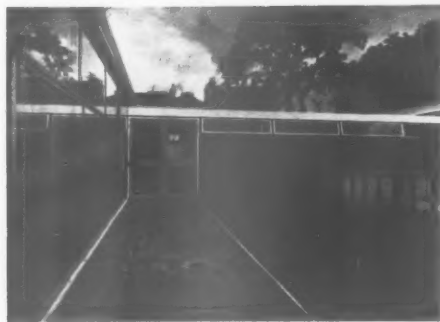
- 1 1/4" textured glass backed with yellow pigment
- 2 ditto deep blue
- 3 ditto green
- 4 lime green painted soffit
- 5 prismatic glass panels
- 6 white glazed brickwork
- 7 exposed steelwork painted black
- 8 purple-brown sand faced brickwork
- 9 doorframes painted grey with white cross bars
- 10 internal ceiling painted orange-red





13

SCHOOL IN SOUTH KENSINGTON



14



15

13, west staircase to gallery above junior enclosed court. 14, looking east along this gallery; classrooms on left.

15, inside junior court, looking down steps to amphitheatre. 16, schoolkeeper's house.



16

continued from page 153]

are planned in a block to the south of the infant hall to which they are linked by two wings containing cloak-rooms and lavatories, thus again enclosing a small courtyard. This form of planning allows the cloakroom and lavatory accommodation to be dispersed and grouped with the classrooms, so that circulation within the building is reduced to a minimum. All classrooms have windows on at least two sides, which make it possible to ensure good day-lighting while limiting the room heights to nine feet.

The structure is supported principally by a steel frame; where dividing walls are required, these are usually load-bearing or employed to brace the frame. Up to about 6in. above ground level all the building work is carried out in concrete or brickwork, above which the steel frame rises. The upper floors are supported on timber joists, resting on the steel structural beams.

The steel frame is exposed, protected from corrosion by shot-blasting and zinc spraying, and finished with paint. The jointing of the steelwork is partly bolted and partly welded; the aluminium members are left in their natural state. The concrete and brick plinth round the building on which the steel frame rests is capped with a slate cill cut to fit round the steelwork and at door openings in external walls, slate 'gaiters' are provided to protect the stanchion bases and the bottom of the door linings from corrosion and rot: door linings, frames and doors are timber throughout. The coloured glass panels at first-floor level are backed with plywood: internal brick walls are finished with plaster and the

partitioning of the staff rooms is formed with dry hollow core plaster board panel finished with a setting coat and painted. The circulation area at ground level is defined by blue quarry tiles; the classroom floors downstairs have a resin-bonded mastic finish and the sunken floors of the two assembly halls are finished with East African olive strip flooring; the boarded first floor is covered with p.v.c sheeting throughout. The glass used in the cladding includes clear sheet, polished plate, wired plate, prismatic, and rough cast backed with a vitreous enamel colouring. Out-

side, the forecourt, the internal courtyards, and the base of the amphitheatre are paved with second-hand York stone obtained from Kensington Borough Council. The amphitheatre steps are of concrete cast in situ.

Assistant architects were John Connaughton, Ross Chisholm and Michael Neylan; the consultant structural engineers were D. Lax and W. H. Willatts, and the consultant heating engineer was H. J. Knox. Quantity surveyors were Davis, Bellfield and Everest.



Wet-worked gravel pits
(above) constitute a landscape
blight, but they can become
landscape assets without
elaborate reclamation—
planting and grading of their
margins can produce lakes
like that at Rickmansworth
(right) that enhance the scene.



Kenneth Browne

High transport costs of a product that has low intrinsic value for its bulk cause sand and gravel workings to concentrate closely around major centres of population. Although there are therefore the usual suburban economic pressures for their total reclamation when they have been worked out, there is also a case for their retention—particularly in the case of wet pits—as landscape amenities, located, as they are, close to urban concentrations.

Dereliction: 3

One result of the ever growing use of concrete for buildings and road construction is a parallel increase in the demand for sand and gravel to use as aggregate. Since the first world war the demand in this country has multiplied by 14 until it is now about 27 million cubic yards a year. As most of the material is surface-worked in comparatively shallow pits this represents a considerable acreage of land laid waste; indeed, it is estimated that at the present rate of working approximately 1,500 acres of land each year are eaten up in this way.

Though sand and gravel are found widespread all over the British Isles, the problem of large scale dereliction caused by their extraction only arises in the vicinity of the heavily built up areas, for being bulky and of low intrinsic value (in contrast to, say, china clay or coal) the cost of transporting sand and gravel is a very important item and determines the area in which they can be produced economically. The exception is where a special quality of material occurs, as for instance the lower greensand belt between Maidstone and Dorking which supplies most of Greater London's 'soft' sand. In view of the transport factor, it has become common practice to establish ready-mix concrete and precast unit construction facilities at the gravel pit and these, together with the larger and more efficient machinery used for extracting the gravel, increase the likelihood of dereliction considerably. The kind of dereliction left when a pit has been worked out depends on whether it has been worked 'dry' or 'wet', as in the case of low-lying river gravel, where the excavation immediately fills to the water-table level, leaving a permanent lake.

The 'dry' pits do not usually present much of a reclamation problem unless the operator has used his excavator merely to grab out the best pockets of gravel, leaving the rest, when he can make a pretty untidy mess. On the whole, nature quickly heals the scars and agriculture re-established at a lower level has actually been known to benefit from being brought closer to the water-table. It is the wet pits which in the past have aroused such strong public feeling against gravel working generally, and nowhere

more strongly than in West Middlesex, where large areas of intensively cultivated market-garden land have been replaced by a dreary and haphazard collection of waterlogged pits. This area contains the most important concentration of gravel workings in the country, supplying about half of all gravel required by the Greater London area and, not surprisingly, also contains the greatest areas of dereliction (approximately 1,000 acres at the present time). One unfortunate aspect of gravel working is the almost invariable conflict of land use, the best gravels being nearly always found under the best agricultural land, and this is further complicated by the fact that both intensive market gardening and gravel production, if they are to pay, need to be close to their market.

In the past, the irresponsible activities of some gravel extractors, with financial gain as their only object and an attitude of 'damn you Jack,' have wrecked large stretches of this country by scooping out the best material and then moving on, leaving behind rubbish, broken machinery and derelict buildings. It is true that there were instances where, owing to their position and the demand for places to dump rubbish, derelict pits became filled and the land was used for building or playing fields; and others, where the exceptional contractor took trouble to clean up used workings, grade banks and plant trees to hide the scars, but generally speaking the whole thing was left to chance. In some cases, as in the Colne Valley at Rickmansworth, wet pits, more or less left to nature, have formed attractive lakes which are used for boating, fishing and swimming, but generally gravel workings have only added to an unkempt subtopian squalor. Where the bottom is clay, 'wet' pits become stagnant and mosquito-breeding, and are the natural dump for tin cans and old bedsteads.

Since the last war the position has greatly improved, for as a result of public protest and the recommendations of the Waters Committee of 1948*, the planning authorities are now empowered to keep a very tight control on sand and gravel digging, refusing permission to excavate in certain protected areas, and in nearly every case making restoration of the land by the extractor a condition of consent. No longer can he blunder about ripping up the countryside at will. In this matter of control and in the experiments being carried out in the best methods of restoration, the planners are doing a good job of work. All gravel extraction is phased to a prearranged plan, topsoil is stacked and reclamation by filling with waste material takes place whilst the digging proceeds. By this means full use can be made of available transport, and the cost of restoration is spread out over the working life of the pit.

The industry itself has issued two booklets on the subject of land reclamation† as a guide to its members, and besides appealing to their better selves and pointing out their responsibility to the public, they show that it is in the contractors' interest anyway to restore the land, both because of its increased value when resold and because any contractor failing to

keep up to scratch would find himself black-listed by the planning authority when he next applied to dig elsewhere. One way and another a fair degree of co-operation is ensured.

In addition to ensuring the eventual reinstatement of new workings the planning authorities have plotted the position of all the old derelict pits and made a start on their reclamation by directing filling material to them whenever possible. In West Middlesex the obstacle to a more rapid reclamation of the flooded pits, old and new, is shortage of filling material, for while dry pits can be filled with household refuse, which rapidly supports plant growth, under the present health regulations only inert material such as builders' rubble, fuel ash, etc., may be used to fill wet pits. This is because the dumping of household refuse in water results in a fouling of the atmosphere strong enough to blister paintwork. Experiments are being carried out by local authorities at Twickenham and elsewhere to find ways of overcoming this.

In country districts, the filling of wet pits is an almost insuperable problem, and a lake is inevitable. An example of such a situation is at Dunton Green near Sevenoaks, where gravel and sand are being pumped by barges from a large waterlogged excavation. The pit is already used by a sailing club and the limits of working and eventual shape have been decided. The company has a tree nursery by the pit and planting, together with grading and shaping of the banks made possible by the modern machinery available on the site, proceeds along with the excavating. However, it is close in to the built-up areas that lidos and boating lakes, etc., would be most welcome, and this is just where, by rule of thumb, they are most likely to get filled in, as filling material becomes available. Therefore, it is in such cases that planning powers should be used with visual imagination so that automatic filling is not insisted upon, and that some of the lagoons and spoil heaps provided gratis are incorporated into the urban landscape. It is just in this aspect of their work that the planning authorities fail. An automatic reflex insisting on the return of the site to as near as possible its original appearance is in many cases a good thing—a landscape of lagoons would be ridiculous; but the planners should be always on the look out for the chance to make use of dereliction, for with the earth-moving machinery now used in excavation there are tremendous possibilities for sculpting the landscape.

* Report of the Advisory Committee on Sand and Gravel to the Minister of Town and Country Planning.

† *Preparing the After-Use of Gravel Pits and The Use of Wet Pits for Fishing.* Published by Ballast, Sand & Allied Trades' Association.



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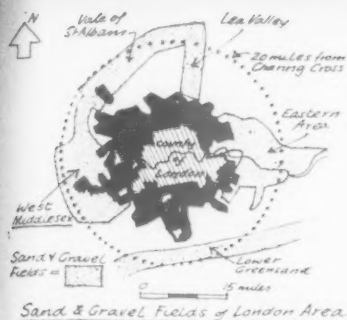
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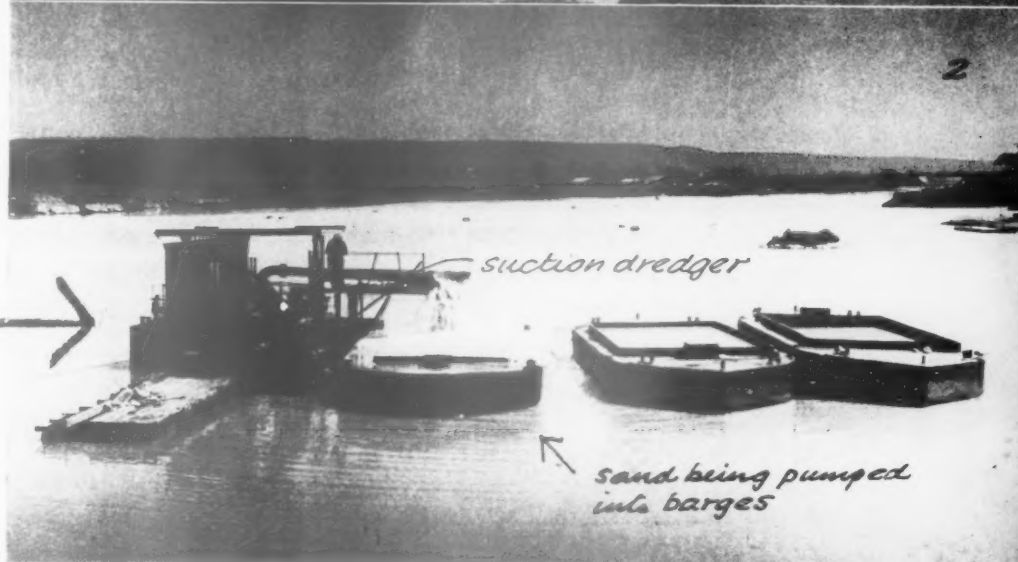


EXTRACTION of Sand and Gravel may be Dry

(where the land is well above the water table). Excavations are usually shallow, merely lowering the level of the ground and by using multi-bucket excavators an even batter can be left to the pit sides.

... or Wet

where the land is low lying and the pit rapidly fills with water.



DERELICTION results mainly from wet pits, as at Feltham, Middx. where 1st class market garden land is being replaced rapidly by waterlogged excavations. Failure to clean up sites after use (4, 5) is another cause.





RECLAMATION of wet pits, by filling, is carried out wherever inert material (eg power station ash 6, or builders rubble 7.) is available and, by isolating non acceptance of conditions small lagoons (A in 8) with inert material, Twickenham Boro. Engineer has reclaimed land with household refuse.

In country districts, enough filling cannot be found and a lake is inevitable. However, if topsoil is stripped 9.

acceptance of conditions and dangerous banks graded & planted 10, the final result can be a landscape asset as at Rickmansworth 14.

Even near cities, it is a mistake always to fill and a scheme at Sunbury to use wet pits 11 as a yacht basin 15. shows the right approach.

b is channel connecting pits. A further channel would be formed to connect with the river.

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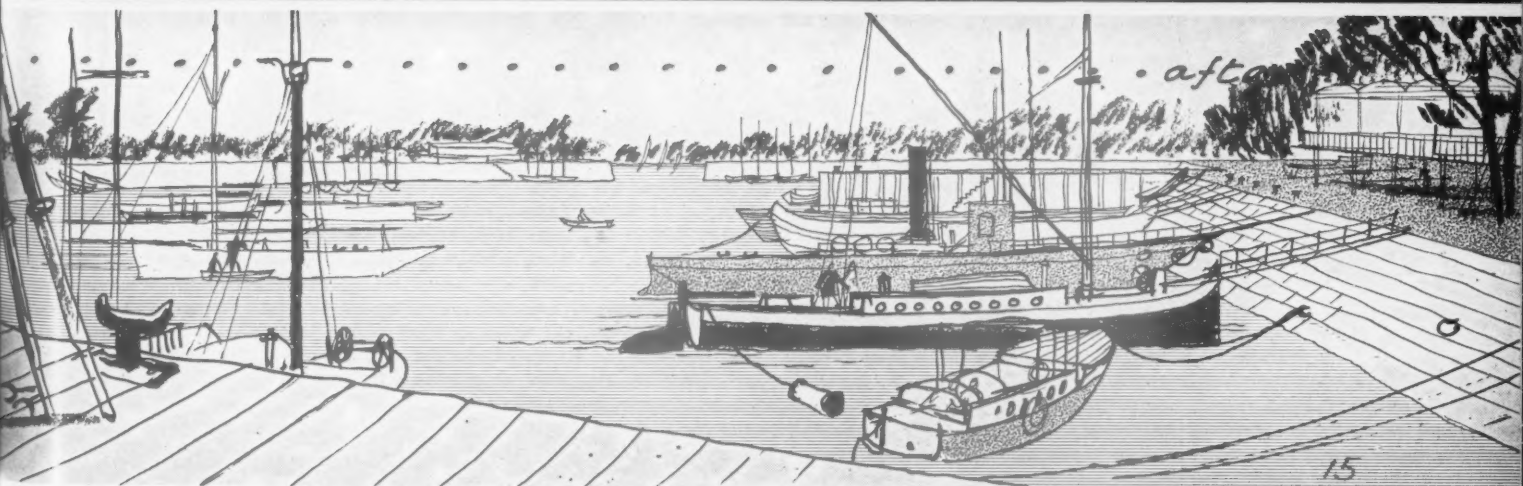
Polytechnic sports ground
Chiswick (wet gravel pits
25 years ago)



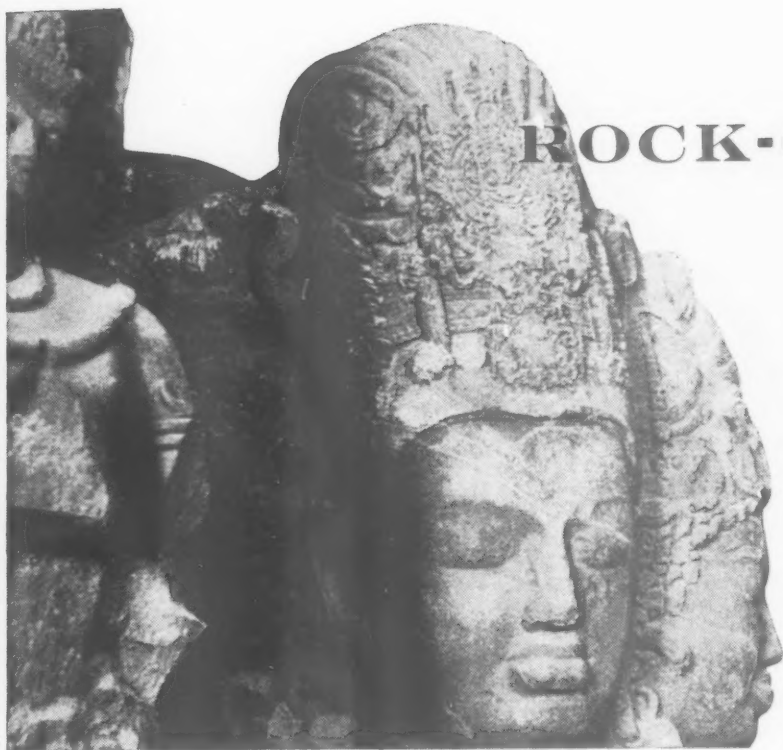
Orleans Gardens,
Twickenham (land
reclaimed 7 years ago)



Rickmansworth Lido
(originally a wet
gravel pit)







ROCK-CUT TEMPLES

Julian Huxley

In India, rock-cut stone architecture preceded stone building, and in the article that follows Julian Huxley gives his impressions of the major monuments of Indian rock-cut architecture. 1, on the facing page, is the two storey temple at Bhuraneshwar, the capital of Orissa, and below it, 2, are some of the twenty-nine cave-temples of Ajanta, carved into a vertical cliff-face. The three-headed figure of Siva above, 3, is one of the ranking masterpieces of Indian sculpture, and the glory of the Elephanta caves, near Bombay.

In 1819, a young British officer, when on a shooting party in the hilly country of the Western Ghats north of Aurungabad, came to the rim of a deep ravine; looking down, he saw a row of openings with carved façades all along the curve of the vertical cliff across the gorge; he descended and found that the black openings were the entrances to a series of twenty-nine temples excavated in the solid rock, all richly carved, and some covered with splendid paintings. He had rediscovered the Ajanta cave-temples, built or rather excavated by Buddhists between the end of the third century B.C. and the early part of the seventh century A.D., and long faded from public memory. The story has often been told; but it bears re-telling, partly because the discovery was so dramatic and also so important, and partly because it is a reminder of the fact that it was the British who rediscovered India's huge forgotten past.

There is rock-cut architecture in other parts of the world—the fantastic tombs and façades of Petra and some of the great tomb-temples of Upper Egypt leap to mind, and along the Seine there are chalk-cut cave-dwellings and the cave-church near Les Andelys. But nowhere else than in India is there such a wealth or variety of rock-cut temples, spread over so long a period of time. For long, indeed, India preferred solid rock to hewn stone as the material to confer permanence on religious buildings, whether to provide enduring embodiments of belief or house-room to a continuing succession of dedicated believers.

In all countries, woody material has preceded stone in architecture.

But whereas in ancient Egypt, for instance, the vegetable prototype was transposed directly into a stone construction, in India, it seems, it was first translated into a rock-cut religious edifice, not a building in the strict sense, but a carving. Only later were free-standing stone temples attempted.¹ And, as in many other countries, stone was not used for dwellings, even for palaces, until long after it was employed for temples and shrines.

This last statement needs a little qualification, for stone seems to have been used for fortifications and ramparts at least by the sixth century B.C., and there were megalithic constructions in Vedic times. Furthermore, the free-standing railings round the *stupas* or holy mounds of earth that represent enlarged tumuli, were translated directly from wood to stone before the second century B.C., and of course Asoka's pillars of the third century were free-standing. But the first stone chambered edifices seem to have been rock-cut, not built.

They are of two distinct kinds—caves and monoliths, the former excavated, the latter carved out of the living rock as a sculptor carves a statue out of a block of marble. At their highest peak, both types may become large many-roomed constructions, sometimes two-storeyed, or in the case of the monoliths, even with several storeys. Both caves and monoliths may be embellished with splendid sculpture, it too of course executed in the rock-mass.

¹ Eventually the adaptation of technique might be reversed. Thus the monolithic temples of Mahabalipuram, which I describe later, seem to be miniature representations of free-standing buildings.

The two monolithic sites I visited—the Seven Pagodas of Mahabalipuram on the coast south of Madras and the Kailasha Temple at Ellora—are both remarkable, though in very different ways. At Mahabalipuram (sometimes spelt Mamallapuram) an entire section of a low granulitic ridge has been cut away to leave five monolithic temples or Rathas, with attendant sculptures, while close by the face of the ridge has been converted into a huge sculptured panel, as impressive in its way as Michelangelo's Last Judgment in the Sistine Chapel.

The entire complex was carried out in the seventh century by the rulers of the Pallava dynasty. The Rathas can be described as architectural sculptures—miniature rock-cut representations of contemporary structural buildings. Very interestingly, they are of three distinct styles, 5 and 6. The smallest and doubtless the most primitive is a simple cell, only 11 ft. square, surmounted by a roof imitated from thatch, such as can still be seen in some modern Indian huts.

Two other Rathas represent temples of the so-called *Vesara* type. These are modifications of the early Buddhist form of shrine known as a chaitya-hall,² which we shall see more characteristically at Ajanta and Ellora. These are rectangular, with a barrel roof imitating wood con-

struction, a carved façade, and an apsidal inner end.

Two others represent Hindu adaptations of *Viharas* or Buddhist monasteries. They are square buildings, the larger 35 ft. high, with open verandahs below, and then a series of three recessed terraces, lined with small-scale representations of the monks' cells (and, in one Ratha, of the monks themselves looking out). The whole is surmounted by a bulbous *stupika*, which is a miniature representation of a Buddhist *stupa* (*tope*) or burial mound: smaller *stupikas* appear at the corners of the terraces. The ascending terraces symbolize different aspects of divinity: (in original Buddhist constructions, as in the stupendous Javanese sanctuary of Borobudur, they symbolize the spiritual ascent towards Nirvana).

In Indian sacred art, as in Gothic, sculpture plays an essential role. Usually the sculpture is an integral part of the architecture. Thus the Rathas have some fine figures carved out of their substance. 8. The style somewhat resembles that which we shall see at Ellora, but the figures are here more slender, less mobile, and colder in feeling. Sometimes, however, we get free-standing sculpture. Here, alongside the Rathas, portions of the rock-ridge have been carved into the likeness of the an *mal* 'vehicles' of three divinities—Indra's elephant, Durga's lion, and Siva's Nandi bull, all of them of a massive grandeur: the elephant in particular shows a striking simplification of form.

But the most remarkable work of pure sculpture at Mahabalipuram, and perhaps in the whole of India, is the gigantic composition, carved

² For my architectural and historical facts I am chiefly indebted to Benjamin Rowland's admirable *The Art and Architecture of India* (Penguin Books, 1953), but also to *Ancient India and Indian Civilization*, by Paul Masson-Ouissel and others (Routledge, 1934), and Murray's excellent *Handbook to India, Pakistan, Burma and Ceylon* (16th Ed., 1948); Percy Brown's *Indian Architecture* (Bombay, 1942) is a mine of information.

on the face of the rock-ridge, known as the Descent of the Ganges. It represents the descent of the sacred river from its Himalayan source, through a multitude of living creatures—animals, holy men and supernatural beings—all rendering praise or obeisance to Siva. Down the central cleft originally flowed a stream of water representing the river, supplied from a basin above and behind the rock. The multitudinous figures of men and animals, including the magnificent elephants, are all life-size.

The stylistic conception is characteristically Indian: the animals and the men (including the wonderful sage in penitential meditation, 9) are robustly naturalistic, while the supernatural inhabitants of water and air, the *nagas* and *devas*, partake of some supernatural essence. The realism, in fact, is so comprehensive that it can include both the material and the spiritual aspects of reality. Apparently the work was never finished, for at its base there are indications of blocking-out for a further array of figures. On the hill behind, close to the modern lighthouse, is another unfinished work, a Rath left unachieved when the Mamalla dynasty came to its end. It shows how (as apparently in all rock-cut constructions) the work was begun at the highest point.

Not far away are some rock-cut cave-temples, I think of later date. Actually they are not caves in the ordinary sense of the word, but excavated verandahs, long and shallow, with segments of rock left along their outer edge and carved into supporting pillars. The inner walls have some fine sculptured panels. One represents Vishnu in his boar-headed avatar or incarnation carrying his goddess-wife in his arms. Another, in a different shrine, shows Vishnu asleep—a wonderful portrayal of repose.

In the eighth century, a later dynasty erected a superb temple of slender *vihara* type on the sea-shore nearby, but as this is a built construction, it does not come into our present story. However, close below it is a hermit's cell excavated in a rock actually washed by the waves, 7.

Such rock-cut cells are not uncommon. There are several in the

natural rock overhang, or whether the excavation was never fully finished.

Leaving the east coast, we now go to Western India. The Elephanta caves on an island close to Bombay are the most widely known of all Indian cave-temples, but this is because they are so easily accessible from the great city. To me at least they do not compare in strangeness with Mahabalipuram or in grandeur and beauty with Ajanta and Ellora, though they do contain some splendid sculpture, including one supreme work of art, in the shape of the gigantic figure of the Siva Trinity, with one of the three heads, august and serene, representing Siva as supreme power, the second angry and destructive, and the third a strange embodiment of youthful but pouting masculine beauty, 3.

From Bombay, first by train through the romantic gorges of the scarp of the Western Ghats, and then by car over the dissected plateau, we reach Ajanta. No fewer than twenty-nine sacred caves were excavated in the trap-rock of the gorge, during a period of eight or nine hundred years before the decline and supersession of Buddhism in India. These may be treated together with the twelve Buddhist caves at Ellora, which date from the closing period of Indian Buddhism, from 350 to nearly 700 A.D. These Buddhist caves are of two types—the more numerous *viharas* or monasteries for Buddhist monks, and the *chaityas* or sacred halls for assembled worship or meditation. The *viharas* are generally square in plan, with cells round a central space. In the more elaborate ones, the flat roof is supported by rows of pillars, and there is a sanctuary or chapel at the inner end. They are usually entered through a verandah supported by pillars. One, at Ellora, seems to have been designed as a refectory or a place of secular assembly.

The *chaityas*, on the other hand, are long rectangular halls, with an apsidal end and a upcurved vaulted roof, copied from timber construction. There is a prominent shrine of *dagoba* type (i.e., a miniature modified *stupa*) in the apse, and the central space is surrounded by a continuous aisle, access to which is had between a row of high pillars, 11. The exterior generally presents a richly-carved façade. This often included a window with horseshoe opening and double ogee moulding—a characteristic but not very attractive feature of this period of Indian architecture.

The carved pillars of the later *viharas* are of a wonderful variety and richness. Sometimes, fluted circular columns emerge from a square rock-base: the capitals of some are double cushions or 'turbans,' of others single cushions surmounted by a laterally spreading member supporting the roof; still others are rectangular in section, with slightly tapering sides and carvings reminiscent of Renaissance design on their face, and surmounted by a carved horizontal slab.

The verandahs of the *viharas* are sometimes simple, but the later ones frequently elaborate, with abundance of carving. In some cases they are two-storeyed, with a balcony above the verandah. At Ellora, where the cave-temples are cut into a rock-slope instead of into a vertical cliff-face as at Ajanta, the verandah forms the back wall of a spacious open court. In one such case, the verandah has enormous projecting eaves imitating timber construction, a remarkable piece of rock-carving!

Ajanta is above all famed for its

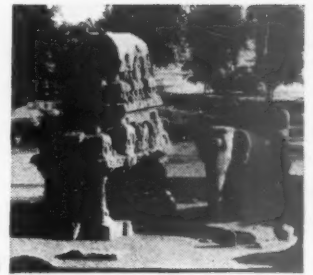
paintings—the greatest treasure of early Indian pictorial art. They have been described and reproduced in a number of publications,³ so I shall not attempt to discuss them here *qua* paintings. However, painting was also employed at Ajanta as decoration for architecture. In particular, the roofs of some caves are carved to imitate coffering, and the square coffers are occupied by painted designs of—to me at least—surprising type. Some are in black and white, with rich floral patterns, while in others animals or female figures emerge from the flowery background, 10.

Finally we come to the sacred site of Ellora, which was doubtless developed in imitation or emulation of Ajanta. I shall not try to describe in detail the sixteen Hindu (Brahman) and the five Jain cave-temples which were excavated at the same time as or later than the twelve late Buddhist ones. In general they have the same general plan as their prototypes, though all of course have Hindu instead of Buddhist iconography as the basis for their sculptures and paintings, and some have little rock-cut chapels in their fore-courts. I shall concentrate on the stupendous monolith of the Kailasha temple. This, dating from the second half of the eighth century, is one of the most extraordinary man-made structures that I have been privileged to see; and certainly the most impressive monument of ancient Hinduism. It is dedicated to Siva, and is intended as an architectural representation of the god's home, the sacred Mount Kailasha. The representation is not merely a symbolic one: the profile elevation of the building is stated to resemble that of the actual mountain in the Himalayas. According to Rowland, it and other architectural representations of sacred Himalayan mountains were originally painted white to symbolize the snowcapped summits.

The great temple, as large as the Parthenon in ground-plan but one-and-a-half times as high, has been hewn out of the side of a mountain ridge. Three enormous trenches were cut down from the sloping upper surface of the ridge, producing a huge quarry with three vertical walls, but open to the lower ground on the fourth side, and with the hundred-foot-high monolithic mass in its centre. To obviate the impression of the temple being sunk in a dark pit, the lower 25 ft. of the central monolith was left as a podium on which the temple proper is elevated. The podium is carved in full relief with figures of animals: the frieze of the fore-parts of elephants emerging from the rock on the innermost face of the podium and seeming to support the great mass above on their backs is especially impressive.

The temple is flanked by two enormous free-standing columns, elaborately carved, 14, and on one side by a life-sized elephant on the quarry floor. Further, it is connected by stone bridges with subsidiary halls and verandahs cut in the side walls, so that the quarry constitutes a courtyard for the shrine. The temple itself is very elaborate. It is roughly cruciform in shape, with an asymmetrical pair of pillared 'porches' or *mandapas*, corresponding to the transepts of a Christian church, forming the short arms of the cross. Along its main axis, there is a series of *mandapas* with an ambulatory outside them, leading to the dark and massive-walled cella, the holy of holies

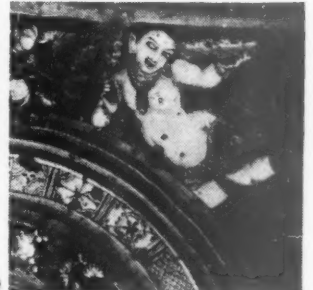
³ The latest is *India: paintings from the Ajanta Caves*, in the *Unesco World Art Series* (New York Graphic Society, 1954), with some fine folio-size reproductions of colour photographs.



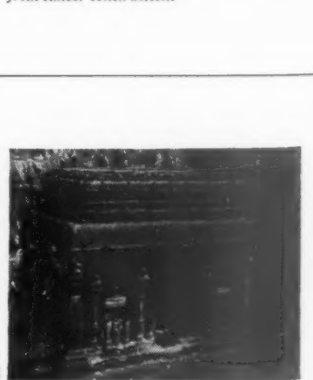
Mahabalipuram 5 and 6, monolithic temples or Rathas, which are miniature representations of contemporary structural buildings, with attendant sculptures. 7, hermit's cell excavated on the sea-shore near Mahabalipuram. 8, carving on the sides of Rathas. 9, figure of sage in meditation, part of the composition carved on the face of a rock-top, known as the Descent of the Ganges.



Ajanta 10, roof-painting of female figure emerging from flowery background. 11, chaitya with apse and vaulted roof, copied from timber construction.



Ellora The Kailasha temple (second half of 8th century A.D.). 12, a shrine. 13, central monolith. 14, one of two free-standing columns flanking the temple. On the left an Atlas-like dwarf appears to support the cornice.



Ellora The Kailasha temple (second half of 8th century A.D.). 12, a shrine. 13, central monolith. 14, one of two free-standing columns flanking the temple. On the left an Atlas-like dwarf appears to support the cornice.



4, a rock-cut cell in the hills behind Bhuraneswar, the opening carved to resemble a savage animal.

hills behind Bhuraneswar, the capital of Orissa, including one with its overhanging entrance fantastically carved into the likeness of the head of a gigantic and ferocious animal, 4—whether a serpent or a stylized tiger it is hard to say. The carved caves on this site total 63. Besides cells they include some large temples of the shallow 'verandah' type, with sculptured panels on their walls. One is two-storeyed, with a fenestrated ground floor, and a first floor in the shape of a balcony, supported by square pillars. These are of varying height, but it is not clear whether this is an adaptation to the

6



8,9



11



13, 14



where a huge *lingam* of Siva is still worshipped, and round which five lesser shrines are placed, 12. Over this holiest area, at the innermost end of the mass, rises the spire with its four recessed terraces and its crowning *stupika*, a much enlarged version of the spires of the *vihara* Rathis at Mahabalipuram.

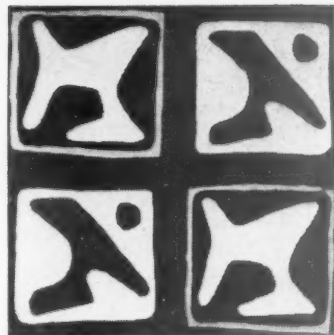
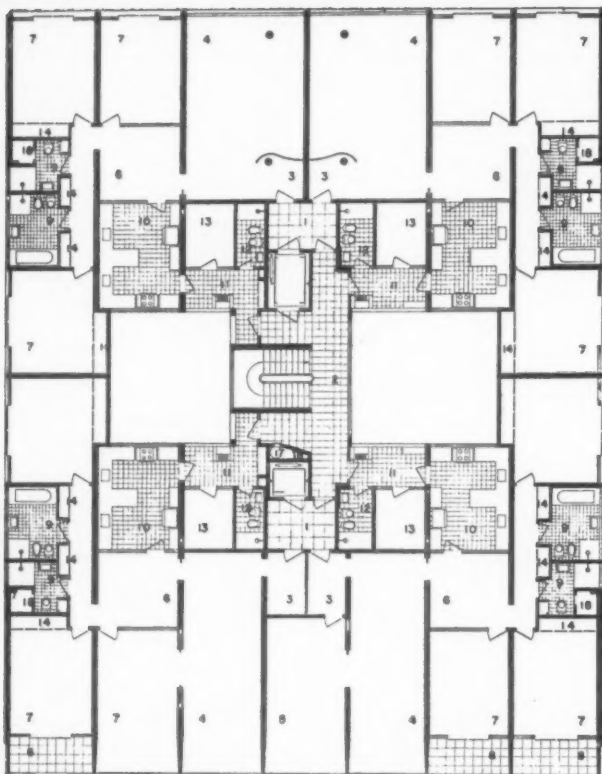
Never shall I forget the view of this from above, 13. I had climbed up the stony flank of the ridge in the oven-like heat of an Indian April mid-day. From the lip of the quarry I looked down on the great pyramidal spire, standing out boldly in bright sunshine against the black-shadowed wall of the quarry. On the topmost terrace was a white speck, which my field-glasses revealed as an Egyptian Vulture (Neophron) on its nest.

The next section of the roof had at its centre a circular drum, surmounted by four stone animals (all, be it remembered, carved out of the single mass), and bordered with little stone templecules. Beyond this again was a rectangular structure of very satisfying proportions, topped by carved cornices, and with beautifully spaced figures flanking its plain entrance doorway on its longer side, 12.

Wandering through the halls and shrines, up and down flights of stone steps, and round the ambulatories, my admiration of the grandiose design of the building and of the lovely detail of its figure sculptures was interrupted by constant shocks of surprise and wonder that the whole was one single piece of sculpture—surely the largest and most elaborate the world has ever seen. The figure sculpture is noteworthy in itself. The flying figures on the walls, though wingless, convey the sense of airborne flight more convincingly than any winged angel; and the Atlas dwarf supporting one corner of a cornice is a delightful grotesquerie, 14. The finest of all the sculptures, 'The shaking of Kailasha,' I was unfortunately unable to photograph. It is embedded so deeply in its stone frame (symbolizing in a moving way the idea of daimonic forces in the interior core of things) that it is illuminated only at certain times of day, which were not those of our visit; and I must refer my readers to Rowland's plate 119.

It represents an incident in the Ramayana. The giant demon Ravana, having penetrated the bowels of Mount Kailasha, is attempting to uproot it so as to use its store of sacred energy as a weapon against his enemy Rama. Multi-headed and multi-armed, in the cave of a deeply-cut recess, he is exerting all his force to break the rock-mass asunder. But Siva, high in air on the summit of the much-stylized peak, shows the effortless superiority of his power; relaxed and serene, he frustrates the demon's violence by a light pressure of one foot on the surface of the mountain. His goddess-wife Parvati shrinks against him as she feels the trembling of the solid rock beneath, while her maid-servant runs towards her in fear. The whole is like a superb stage-setting of a cosmic drama. This theatrical (but not theatrical) style of sculpture, which was continued in the sculptures at Elephanta, is so far as I know a purely Hindu invention.

Reluctantly leaving Ellora, we drove to Aurungabad, to find there a reminder of the amazing variety of Indian architecture—one of the southernmost specimens of Moghul building, a domed tomb very like the Taj Mahal on a reduced scale. But that is another and very different story.



Right, the hydraulic-ally pressed tile, designed by Roberto Burle Marx, for the external facing to the west wall, ground floor. See illustration 4.

FLATS IN RIO DE JANEIRO

key to plans

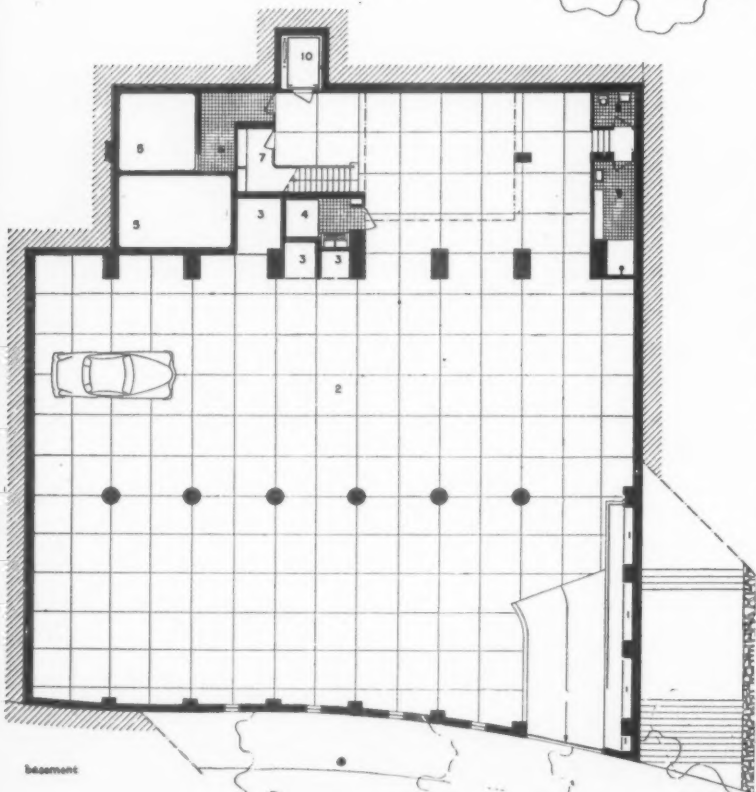
- | | | |
|--|---|---|
| basement
1. gas meters.
2. garage.
3. store room.
4. garbage incinerator.
5. water tank.
6. pumps.
7. electricity.
8. washroom and w.c.
9. cloakroom.
10. passenger and freight lift. | 5. playground.
6. main hall.
7. service hall.
8. electric meters.
9. porter's living room.
10. porter's bathroom.
11. porter's bedroom.
12. porter's kitchen.
13. service balcony.
14. built-in service cupboards.
15. passenger lift.
16. passenger and freight lift.
17. garbage chute.
18. pipes. | 2. service hall.
3. vestibule.
4. living room.
5. study.
6. dining room.
7. bedroom.
8. verandah.
9. bathroom.
10. kitchen.
11. service terrace.
12. servants' bathroom.
13. servants' bedroom.
14. built-in cupboards.
15. passenger lift.
16. passenger and freight lift.
17. garbage chute.
18. pipes. |
|--|---|---|



ground floor

RUA BENJAMIM BATISTA

1st to 6th floors



basement

FLATS IN RIO DE JANEIRO

ARCHITECT

JORGE MACHADO MOREIRA

1. window of living-room looking south towards Rodrigo de Freitas lagoon. At the top, on the inner side of the trellis, are pivoting slats; in the centre, sliding frames, together with venetian blinds, and at the bottom horizontal pivoting slats, forming a brise-soleil.



The Antonio Ceppas Building, an eight-storey block of flats, was built in 1952, and is one of the architect's two buildings premiated at the Sao Paulo Biennale in 1954 (see AR, June, 1954).

The block is reinforced-concrete framed, and infill walls are mostly of artificial stone, a few of fair-faced brickwork. It stands in a residential street with a steep

gradient; the ground floor is considerably above street level, and a 24-car garage is in the basement. Access to the ground floor from the street is by a wide flight of granite-faced steps protected by a canopy which is independent of the main structure. The enclosed area on the ground floor is relatively small; a much larger area is laid out, by Roberto Burle Marx, partly as a garden and



2

FLATS IN RIO DE JANEIRO

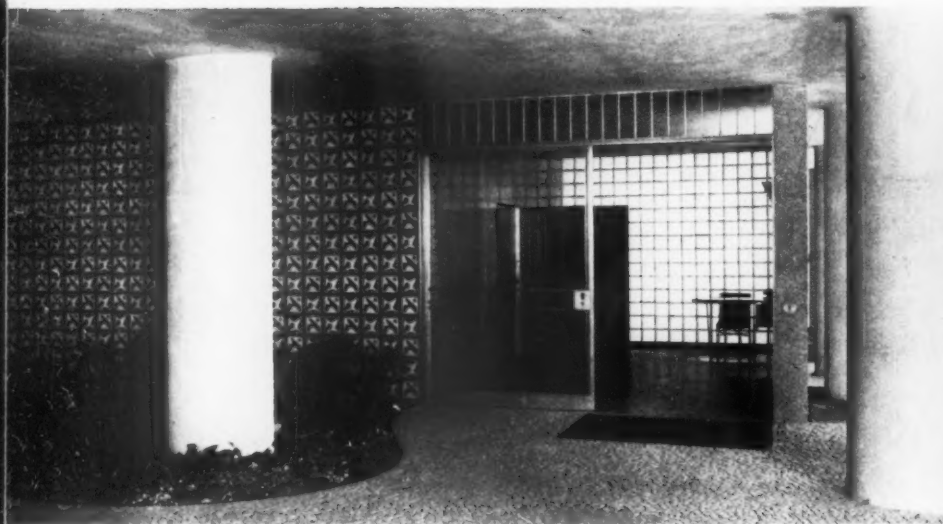
2, the south-east corner. 3, typical living-room facing south. 4, one of the halls at ground-floor level seen from garden and playground area ; the wall tiles and the glass mosaic in 5, which shows the same area seen from the opposite direction, are by Roberto Burle Marx. The large hall window is of glass bricks, and the outside floor paving of Portuguese stone mosaic.

partly as a playground, which forms a single entity with the garden surrounding the building. Burle Marx also designed the tile facing for the wall between the two main entrances and the glass mosaic mural on the wall above the small pool.

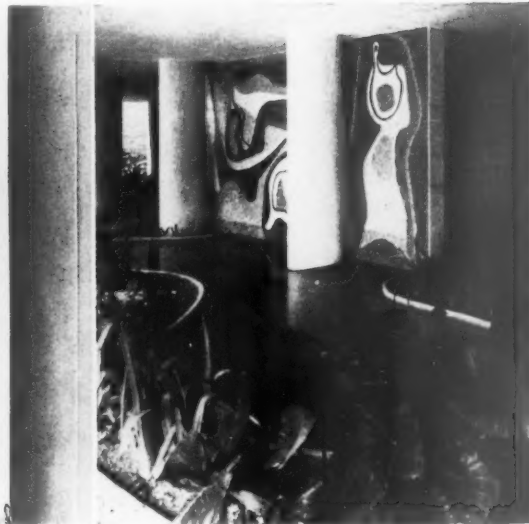
The paths are of white, black and red Portuguese stone mosaic, and the pilotis are faced with light-grey marmorite. The variety of external wall facings is considerable : for the ground-floor walls, either mosaic or random stone, the hall windows being of glass bricks ; the exposed framework and sides of the boxed-out balconies on the south façade in blue mosaic, which is also used for the top of the entrance canopy and the concrete frames of the sliding windows on the rear (north) façade ; and the whole bedroom verandahs and the upper sections of those in the living-room are fronted with traditional wooden trellis-work painted yellow. The inside walls and ceilings of the bedroom



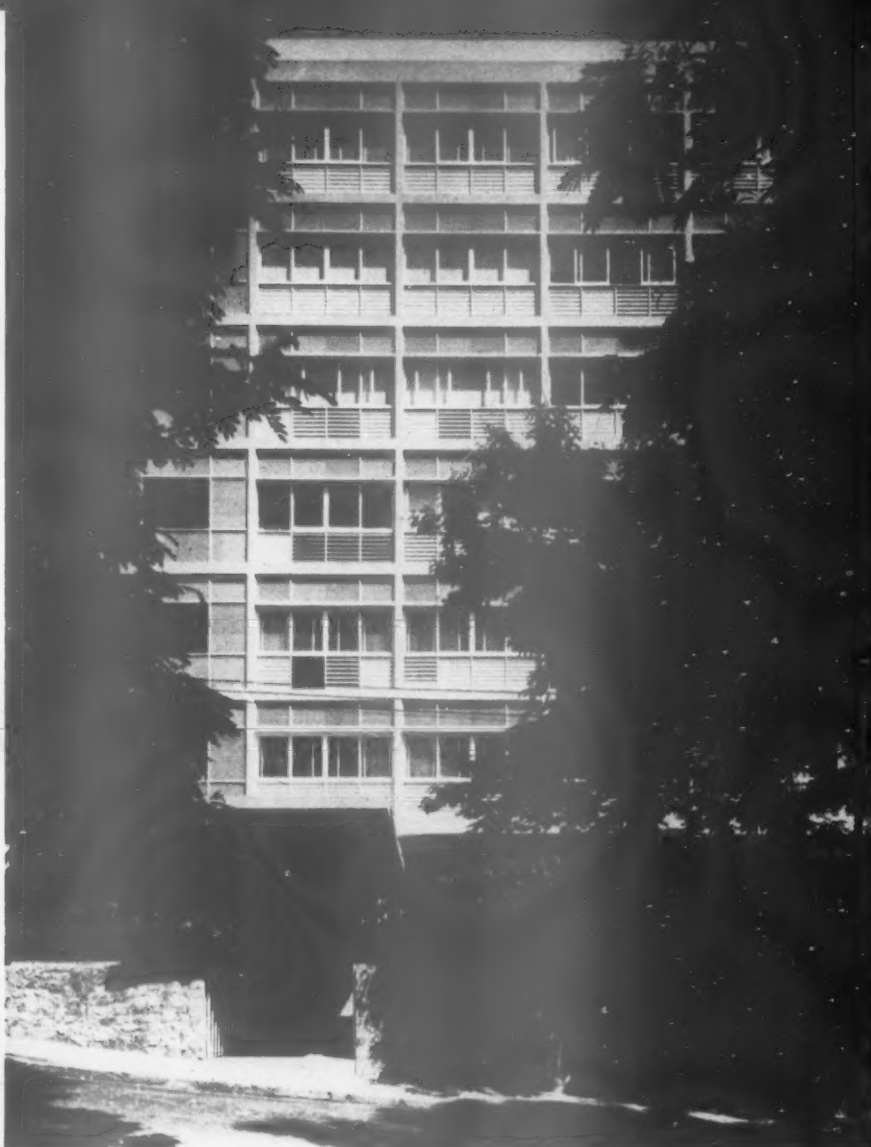
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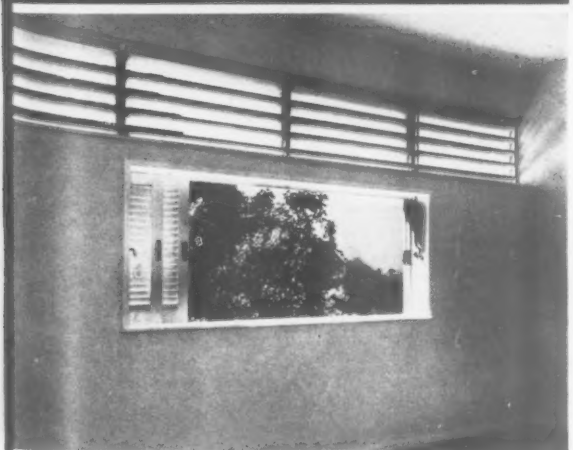
4



5



7



6, 8

FLATS IN RIO DE JANEIRO

6, the east and 7, the south façades of the building. On the south, trellis work across the upper part of windows indicates living-rooms; trellis alone with windows set back indicates bedrooms. Bedrooms on the lateral façades are as in 8,

with lever-operated *brise-soleils*, top, for additional light and ventilation, and sliding windows and shutters under. 9, a verandah seen from one of the bedrooms on the south, with pivoting louveres over the inner opening.

verandahs and the wall panels along the east and west façades between the rows of windows are painted the blue of the mosaic. The window frames are white.

The sitting-room windows on the south are in three parts: the upper, behind the trellis, consists of pivoting slats; the centre of sliding frames, with venetian blinds, and the lower of horizontal pivoting slats, forming a *brise-soleil*; this arrangement makes it possible to open up the entire window space and enjoy the view. The bedrooms on the east and west sides have both sliding windows and sliding shutters, and in the upper sections horizontal pivoting slats running the whole width of the rooms, ensuring good lighting and ventilation.



9



Given a wide-open plain, and an airport, the scene in the upper picture is probably inevitable and technically excusable. But given a point where plains and hills meet, and a town, the scene in the lower picture is beyond excuse. That the townscape of Nairobi should be almost as empty as the landscape of its airfield, that the wide-open spaces which surround the town should be allowed to penetrate inside it—these typify all-too-common faults of Commonwealth urbanism, discussed in the article by Roger Johnson on the pages which follow.

GREAT OPEN SPACES

PRAIRIE PLANNING IN NAIROBI

Fast-grown towns, sprawling overgrown towns, gappily developed, dominated by the motor-car, towns less than a century old, are no prerogative of the Americas. A fair proportion of them are in the British Commonwealth, their growth watched over, their plans drawn up by men with British training, or offices in the Home country. We are quick enough to criticize transatlantic failings, but how are we making out, how are we dealing with the problem of new cities in the outback?

On the pages that follow will be found some revealing photographs of Nairobi, and a commentary on them by Roger Johnson, who has experience of the life and character of more than one city in the bustling half-continent we are learning to call *Africa South of the Sahara*. Pictures and text combine to emphasize the emergence of a virulent strain of urban blight—not restricted to Nairobi, nor to Africa even—that might be called Subtopia from Scratch, the sprawl of towns that never had an urban pattern to spoil, that never had a heart to destroy.

The legislative pattern behind these sprawling towns depends on water-tight zoning laws, and the available empty space in which to realize them, sufficient empty space to leave dead strips as *cordons sanitaires* between one zone and another. This tendency to prairie-planning that leaves acres of real prairie, scrub, or jungle within the city limits is aided and abetted by grandiose Beaux-Arts paper plans that paralyse central area development within an inert abstract geometry of scaleless vistas and park-sized civic centres. Laid down, inevitably, across areas not yet built over, these paper diagrams tie up further areas of outback within the city, depriving it of the contrast that such a new town needs between the unreclaimed wilderness without and the man-made urbanity that should exist within. It is a fallacy to suppose that wide-open spaces demand wide-open towns. Along boulevards driven across the scrub, Government buildings and office-blocks begin to appear almost at random, each accompanied by

its own dead acres of parking lots, or lines of vehicles sweltering in the sun along the kerb, effectively isolating one side of the road from the other. Yet in this randomness of development lies the seed of hope. Not only do the unbuilt lots provide room to think again, to provide pedestrian preserves or out-of-sight parking facilities, but the haphazard siting of the buildings may provide clues to a more natural circulation for men and vehicles. Roger Johnson suggests one possibility at the end of his commentary.

COMMENTARY ON NAIROBI BY ROGER JOHNSON

The revealing eye of the aerial photograph seldom shows up a city to æsthetic advantage, but it does offer a clear picture of the pattern of growth. This is exceptionally true of the photographs of Nairobi shown here.

Nairobi's age would make a Mid-Western city seem very well established. From 1899, when the Uganda railway had reached the point where the long stretch of plains gives way to the Highland country and made its headquarters there, Nairobi has grown to a city of over 100,000 persons.

The original town street, Government Road, can be seen in 5, p. 176, running across the foreground with some of the original buildings on the right, and on the left an example of the new scale of the buildings which are taking their place. This one example gives a very clear impression of the change in character which is so rapidly taking place. This illustration also shows what might, rather hopefully, be termed the 'heart' or 'core' of the city, for in and around the two hotels facing each other across the roundabout, the Europeans congregate to meet and talk.

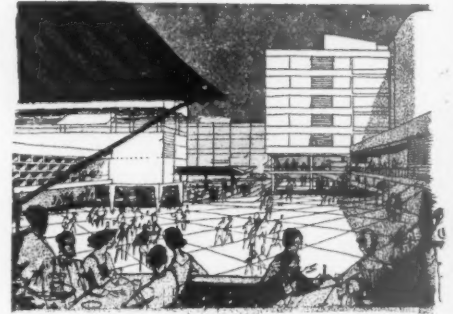
To the south of this existing centre it is possible to see in 2, p. 172, 3 and 4 on the facing page, and 6 on p. 176, the new City Square, with the Law Courts in the centre, flanked by new Government buildings and the Town Hall and faced by the new Parliament building. The basic pattern is in the *Beaux-Arts* tradition, with a central axial way and parallel roads at the edge of the open space, each with further official buildings and a car parking strip under trees, crossed near the centre by the Princess Elizabeth Highway and terminated by a dominant Government building on the hill.

For those of us who have accepted the principles of a centre reserved for pedestrians, of multiple-use rather than rigid zoning, of Goethe's 'Man the measure of all things' against the tyranny of an imposed monumentality, it is a little discouraging to

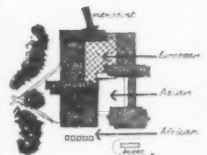
realize that these principles are far from being widely held. In the Commonwealth, and certainly in Africa south of the Sahara, there is a strong belief that the application of these ground patterns on a large scale is what town planning consists of. Here also the attitude is at work that as Africa is a vast continent, so then must the city be reflective of those spaces in the area it covers, with the consequent result of emptiness at the centre.

Responsibility should not be laid entirely at the door of the town planners. So long as decisions continue to be made by committees of men who, admirable as they may be in their own line of business, lack the necessary visual education and vision, and only on the happy occasion listen to their advisers, so will the people get 'not the sort of town they want but the sort they deserve.'

For instance, what an opportunity has been offered by this open area, practically all of which is under public ownership, to graft a new heart into Nairobi before it fails as a city through lack of this vital organ! Here is a suggestion for that part of the City Square adjoining the commercial area showing how it could be developed as a group of small paved piazzas, with ramped access to first floor shopping arcades with cafés (this last may be realized on a small scale in one City Square project), and, rising from this two-storey base, the high slabs of offices, with places of entertainment under and on the roof which would be open at night. Unfortunately, the 'cultural centre' with the National Theatre has already been set up in the north-west corner of the city, for this should be here too. The only addition that this 'core' would contribute to what, after all, is a well-developed theory, would be to accept the challenge put forward by the emergence of the idea of the multi-racial state, and all the difficulties that this is bringing with it. With a population of Europeans, Asians and Africans in roughly



The author's proposals for a humane townscape in Nairobi are shown in sketch form here; to fill up the empty acres between the City Square and the commercial area with interlocking pedestrian spaces for the various racial groups, with adequate built-in shelter from the sun.

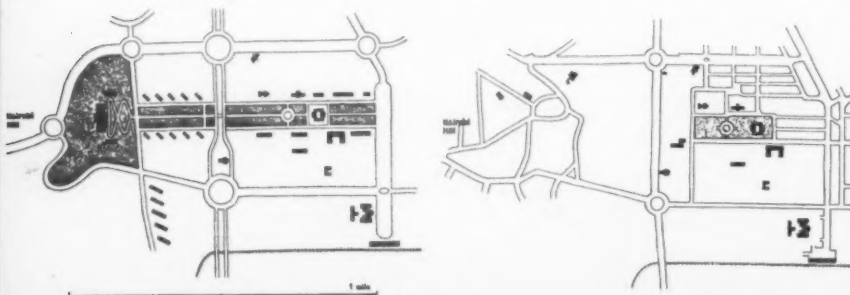


the proportion 1:3:6 the suggestion is to have three interlocking spaces, each with a character given by the predominant racial group. Thus one piazza would be a predominantly European shopping area, another for Asians, and a more open space with eating stalls for Africans, since the last could not afford the rents for anything more substantial at the moment.

The whole theatre of life would then be enacted within this nucleus: a lunch-time scene could envisage the African clerks and messengers eating and sleeping in the shade, their womenfolk with their vivid coloured dress, the smell of spices from the Indian quarter and ideally (and this would be anathema to the 'zone-planner') with their furniture, tinsmith and shoe workshops opening on to the piazza. Finally the mainly European cafés under shade and overlooking the strolling people.

This complex would include Government offices which would lead out into other groups of Government buildings, grouped according to their functions, set in a really closely planted park with the car parks set entirely separately on the perimeter. In this way a true park and not a shaded car park would be brought into the city.

As it is, it is difficult to get enthusiastic about the development that is likely to take place. The complete lack of enclosure and an interesting space definition, combined with the deadening effect of a vast group of Government buildings in their car parks is hardly likely to add anything to the happiness of the individual citizen, whatever his colour.



The grandiose 1048 master-plan proposals for Nairobi city centre, shown shaded, left, have already been cut down to a more modest City Square, shaded, right, but buildings are still far too thinly scattered on the land.



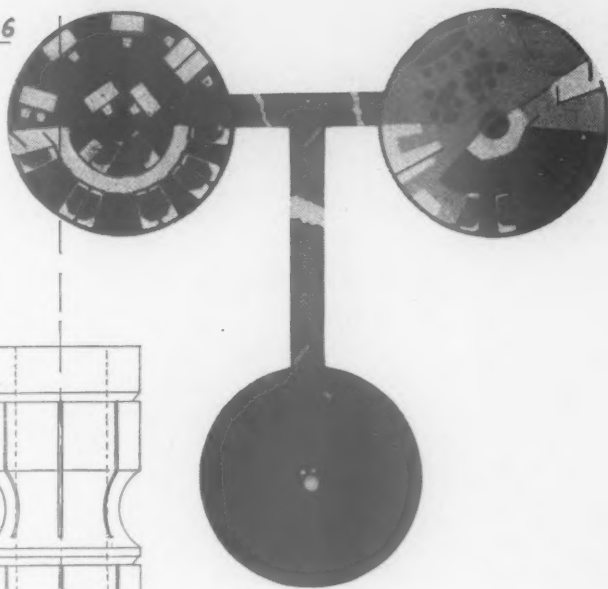
In the foreground of 5 can be seen the junction of Government Street, Nairobi's oldest thoroughfare, with the newer Delamere Avenue, whose trees, as can be seen, are both ineffective and inadequate as shelter for parked cars. This road junction has become the natural centre of Nairobi life, and—whatever its drawbacks—it is clearly preferable to 6, City Square, the sprawling shadeless centre proposed by the 1948 master plan.



5



6



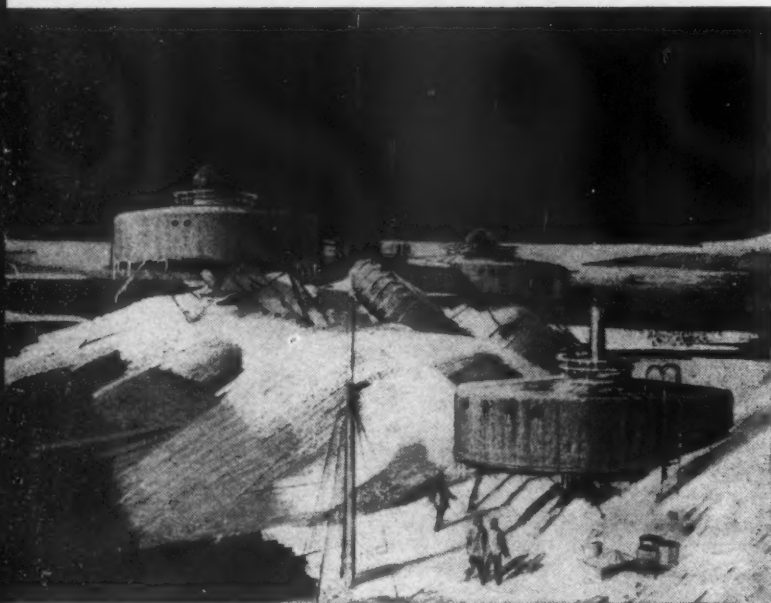
POLAR SHELTERS

PROPOSED PERMANENT BASE OF FRENCH ANTARCTIC EXPEDITIONS

Where funds are limited, maximum performance must be delivered from every member of an expedition, and camping-holiday routines are out of the question—men must enjoy full use of their faculties when at work, and complete security for their relaxation.

The installation which ATBAT was called upon to design was envisaged as permanent on-site equipment for three successive seasons of polar research, of which the middle one, 1956-7, was to count as the French contribution to World Geo-Physical Year. A team of about a dozen men, with equipment sufficiently comprehensive to

* ATBAT; Atelier des Bâtisseurs; international group of architects and engineers, based on Paris, headed by Wladimir Bodiansky.



An impression of the complete base, as it would have appeared, installed on a typical site at Point Geology, Adélie Land.

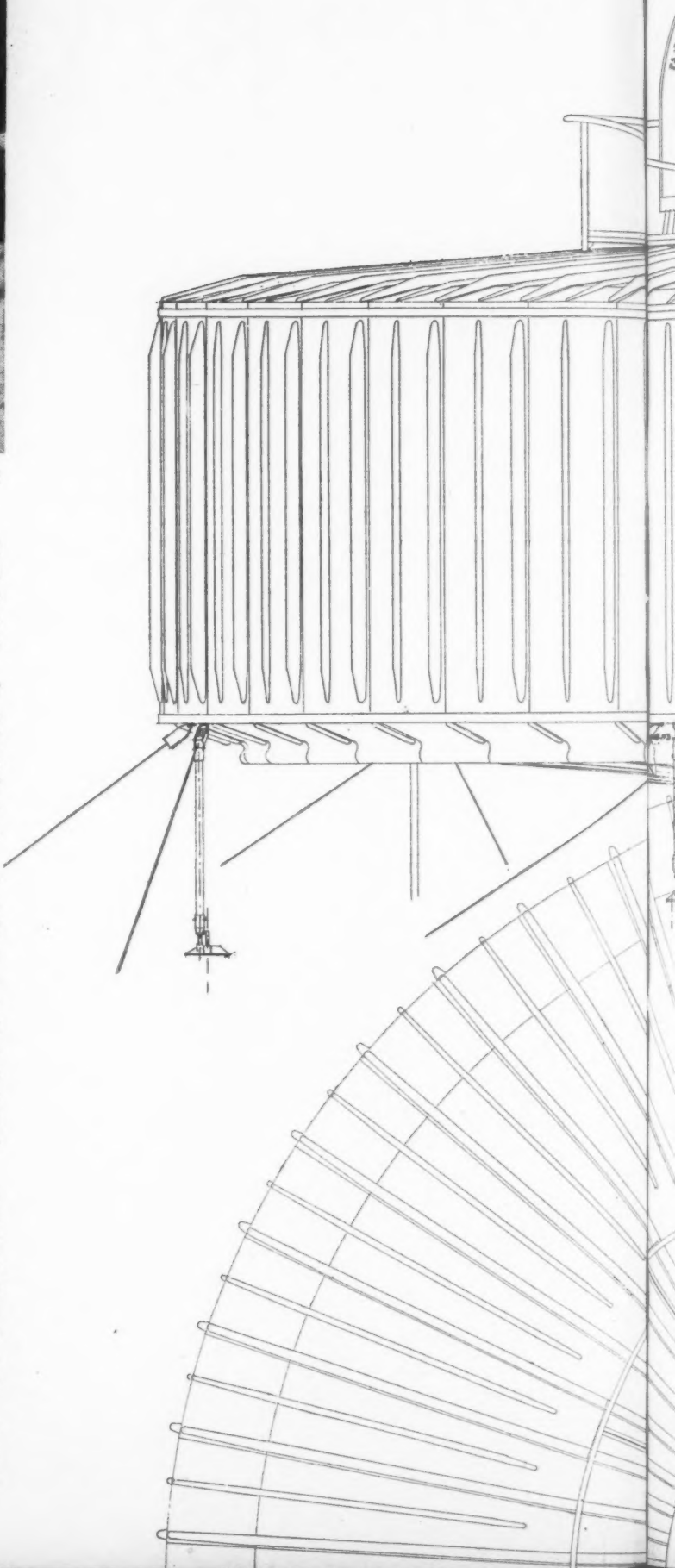
include radar, were to be housed in three circular shelters connected by covered corridors, on a rocky terrain in Adélie Land. Financial cut-backs have caused the abandonment of this comprehensive project, and its replacement by a shortened research programme housed in conventional hutments, but the value of ATBAT's contribution to basic shelter research remains.

The given climatic and geological factors ruled out the possibility of carrying any sentimental or aesthetic overheads derived from concepts such as 'house' or 'home.' Sub-zero ambient temperatures, wind velocities up to 120 m.p.h., risk of fire due to wind-generated static charges, unpromising terrain for any but point-supports, reduction of all elements to the capacity of a two-man lift, provision for assembly with fully gloved hands—all these made it imperative to re-envisage shelter as equipment, as operational apparatus.

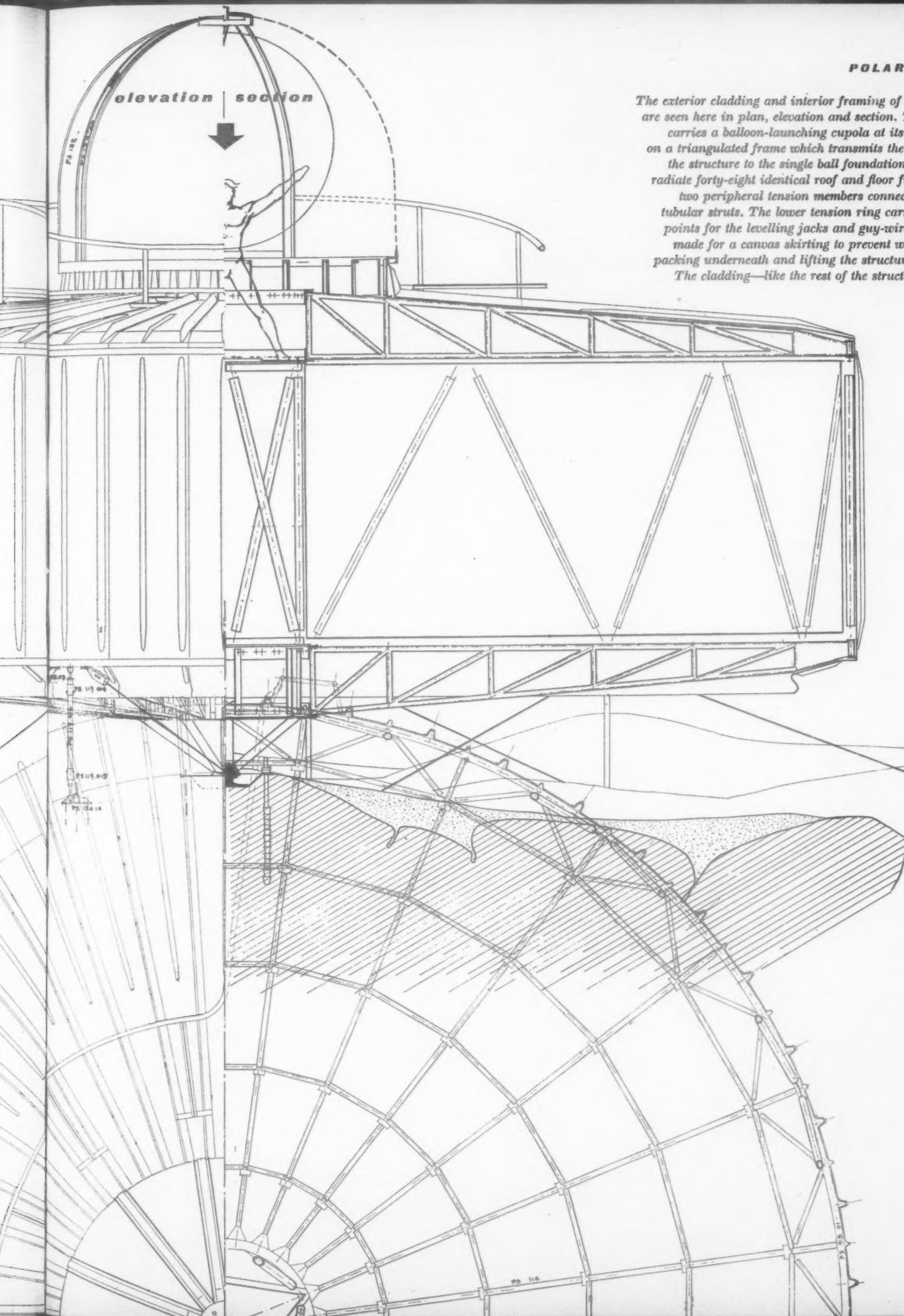
Such a programme might appear an unsympathetic one to a designer whose training did not extend beyond the mental disciplines of architecture as normally understood, but Wladimir Bodiansky, head of ATBAT, had been trained as an aircraft engineer before he joined Le Corbusier's *atelier*, and the exigencies of polar housing were a challenge to redeploy his specialized knowledge of light-weight metallic structure and its associated erection techniques in the service of building design. The resulting working drawings that appear on these pages will have an unfamiliar aspect, with their use of thin sections, precision machined surfaces, their emphasis on joiners and connections, but it should be remembered that they derive from mental disciplines and analytical techniques resembling those discussed in Christopher Dawson's article on p. 201.

As complete building-envelopes, also, they have clear affinities with the structures devised by Buckminster Fuller under the Dymaxion label (ARCHITECTURAL REVIEW, July, 1956). This should hardly occasion surprise, for though Fuller was designing for a generalized, abstract optimum, with world-around relevance, and Bodiansky was aiming to beat a specific, localized minimum, with precise topographical characteristics, both are demanding maximum performance from their buildings, and both take their stand on aircraft structural techniques (Fuller's *Wichita House* is nearest to the ATBAT solution) as offering the highest efficiency, weight for weight and bulk for bulk.

At the point where shelter is stripped of all cultural loading, and refined to the condition of pure equipment, it appears that currently available technique does, therefore, enforce a single acceptable solution, a metal-framed, metal-clad, cylindrical, point-supported norm.



POLAR SHELTERS



The exterior cladding and interior framing of one shelter-unit are seen here in plan, elevation and section. The central core carries a balloon-launching cupola at its head, and rests on a triangulated frame which transmits the main weight of the structure to the single ball foundation. From the core radiate forty-eight identical roof and floor frames, carrying two peripheral tension members connected by diagonal tubular struts. The lower tension ring carries the pick-up points for the levelling jacks and guy-wires. Provision is made for a canvas skirting to prevent wind-blown snow packing underneath and lifting the structure from its base. The cladding—like the rest of the structure—is of steel.

PS 118 04 bis

CARACTERISTIQUES DES RESORTS

FORCE : 1T
COURSE : 10 m/min
LONGUER DETACHEE : 925 m



180

current architecture recent buildings of interest briefly illustrated



1, west elevation of offices, fronting Bunhill Row.

OFFICES IN CHISWELL STREET, LONDON, E.C.1

ARCHITECTS, HANDISYDE AND TAYLOR

in association with HAMMETT AND NORTON

ASSISTANT ARCHITECTS, ERIC MAYNE AND B. P. WARD

Maximum lettable floor space within the limits imposed by the site was the client's requirement for this office building, which is in effect an extension to an existing office building, Friendly House. Since the two buildings could be considered as one for fire escape purposes it was necessary to have only one staircase in the new building; floor levels and the sills and heads of windows in the extension conform to those of the older building. The

entrance is at present through Friendly House, although provision for a separate one has been made at the corner of Bunhill Row and Chiswell Street.

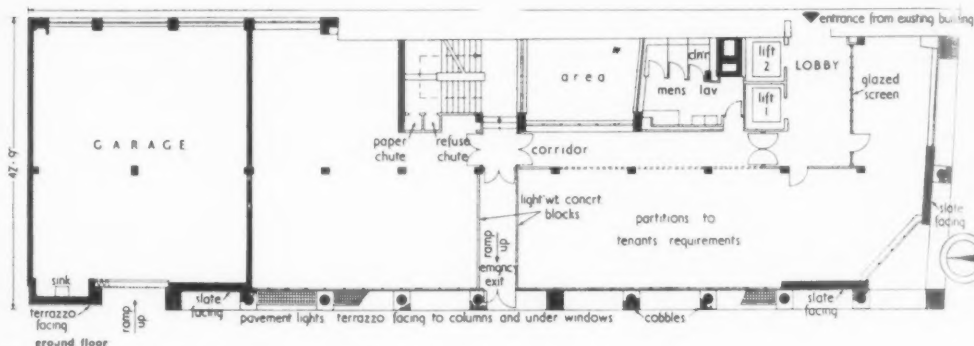
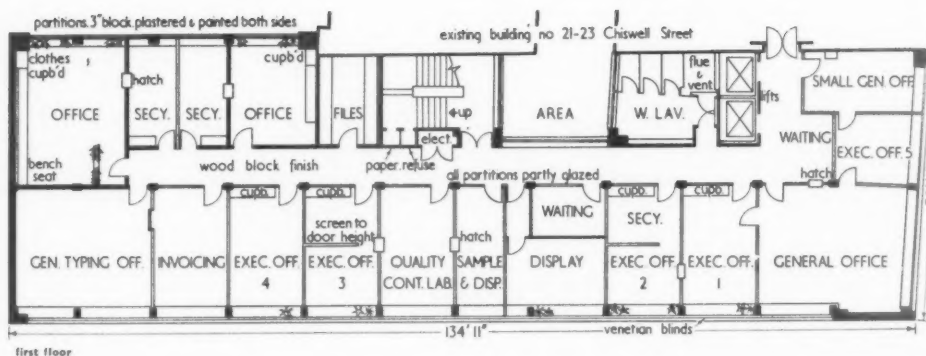
Foundations were not permitted under pavements, and therefore a heavily reinforced basement slab thickened under the stanchions forms the entire foundation. The structure is of rolled steel members, cased in concrete, with bays generally 11 ft. 3 ins. wide, and a line of central



2, main vestibule and lift doors, ground floor. 3, south side, sixth floor.



3



stanchions; flooring is hollow pot. The curtain walls are pressed steel mullions with infilling panels of turquoise-coloured glass; facing to the solid walls is in Portland stone on the upper floors, and terrazzo and Westmorland slate on the ground floor. The internal partitions between offices are aluminium, stove enamelled in various colours, and demountable; those round lavatories, lifts and stairs consist of 3-in. lightweight concrete blocks, plastered on both sides; these are also used for office partitions when more than one tenant is occupying a floor.

Offices in Chiswell Street, E.C.1

TWO SCHOOLS IN CYPRUS

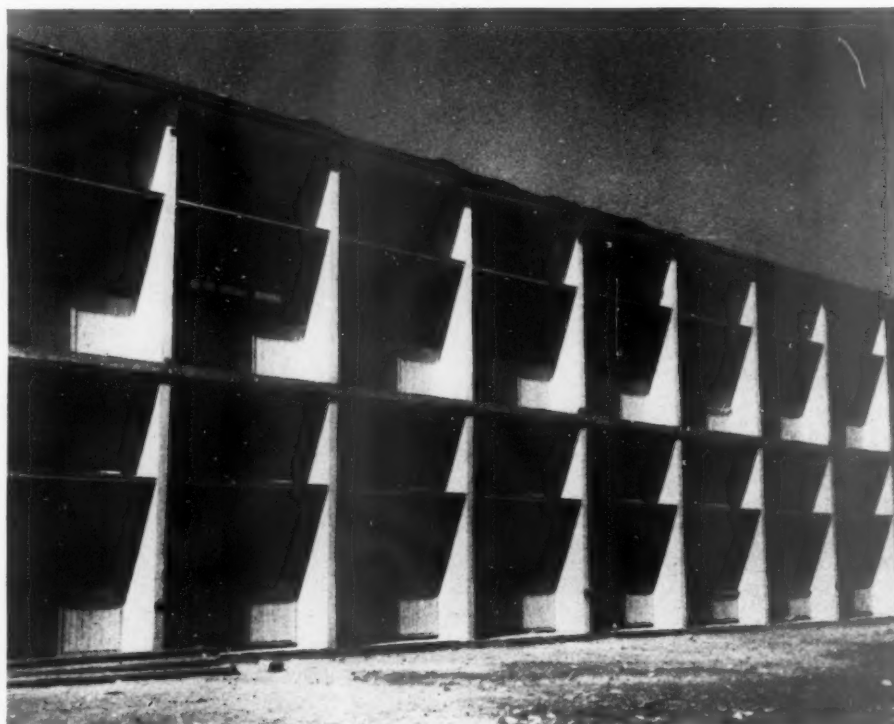
ARCHITECT, ALISTER MACDONALD

As a result of the Cyprus earthquake of 1953, centred in the Paphos District, an urgent need arose for a new Turkish schools group in Ktima, near Paphos, which had to be designed and built as quickly and, owing to financial losses, as economically as possible. At the same time, an almost exactly similar requirement arose in Limassol and the two schools groups were designed on similar lines, making allowance only for minor variations in the use of local materials and for site differences.

The Limassol Group is a fairly level and barren site at the rear of an existing school and municipal housing; trees are being planted and the site generally improved. The Ktima Schools are placed right in the centre of the town; the site was sloping and well wooded.

Each group consists of a secondary and an elementary school, and a combined block for use by both, and by adults for community

4, the Limassol elementary school from the south. A classroom occupies three structural bays.



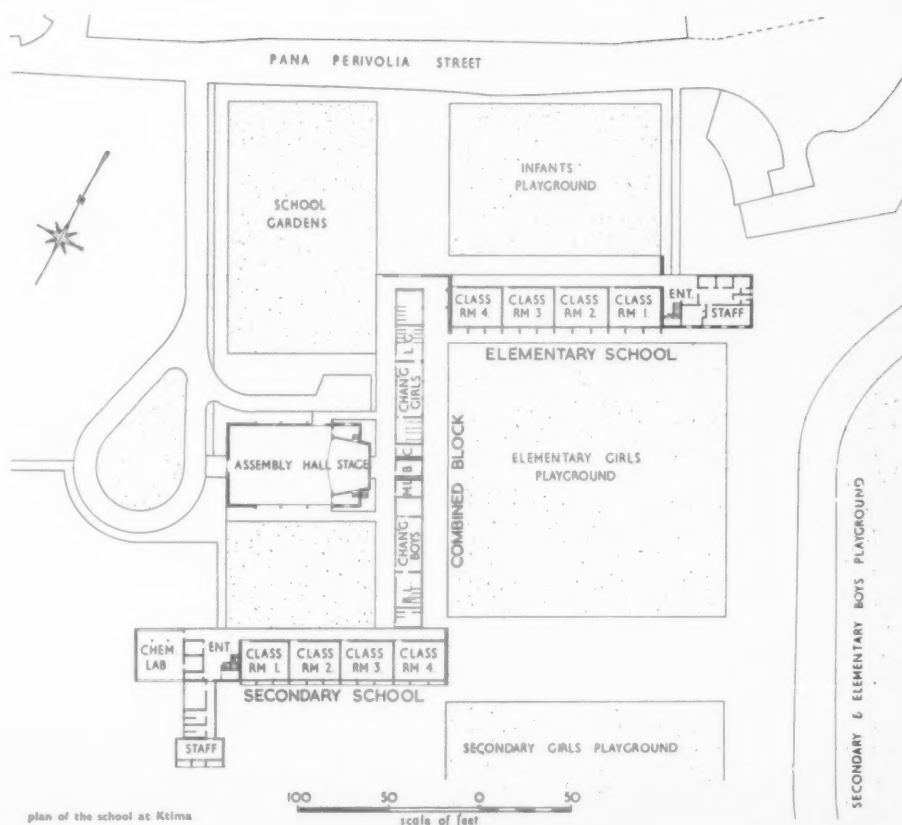


5, Ktima secondary school—progress view of classroom wing showing standard timber infill panels before insertion of horizontal shade hoods.

purposes, comprising an assembly hall-cum-gymnasium, and with a small stage, projection balcony, electricians' gallery, stores connected by covered ways with changing rooms, showers and lavatories. The teaching blocks are two-storied, with access verandahs and practical rooms facing north and main classroom windows facing south, shielded by vertical fin walls and horizontal canopies projecting approximately 3 ft. from the face of the glass.

The secondary and elementary blocks are reinforced-concrete framed, and access galleries and roof overhangs are cantilevered from the main frame. Infill panels to the south elevation were prefabricated and consist of timber framing faced externally with vertical boarding beneath windows, flat asbestos sheeting above windows.

The combined block has load-bearing hollow concrete block walls rendered externally, carrying reinforced concrete and hollow tile flat roofs. The assembly hall is the only unit with a pitched roof, which consists of half-round burnt clay tiles laid on felt and boarding over purlins and welded steel tubular trusses; the boarding is exposed on the under side. Flat roofs are screeded and finished with three-ply built-up roofing felt and white marble chippings for



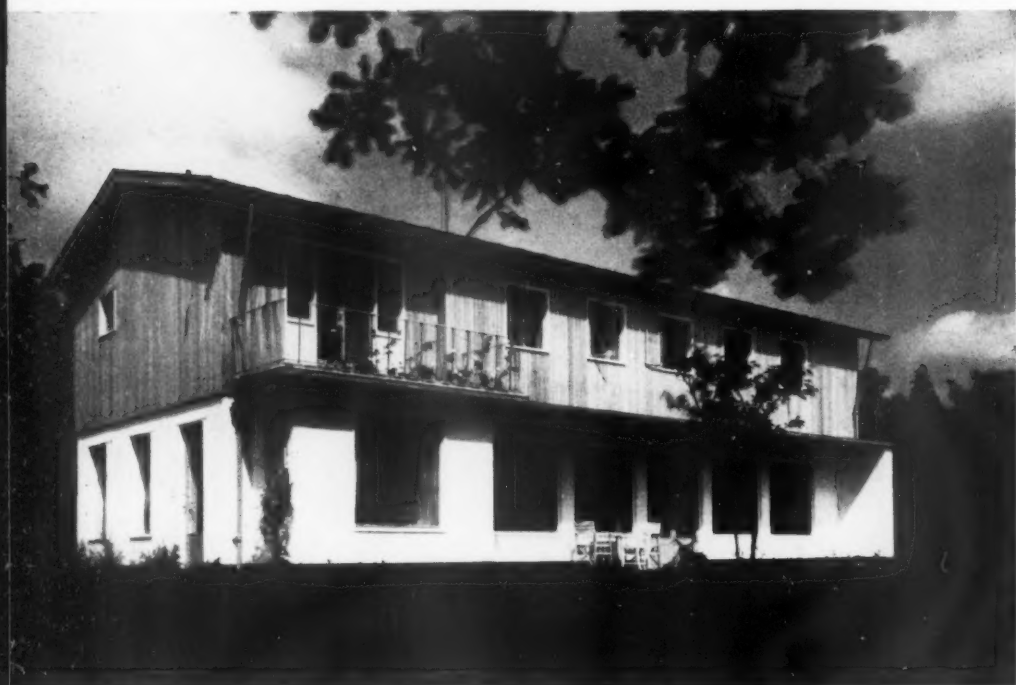
Two Schools in Cyprus



reflection. Walls and ceilings are finished in gypsum plaster; floors are of precast terrazzo tiles in a variety of textures and colours.

The low costs, approximately £31,500, for each school, are due largely to the standardization of design elements.

6, 7, 8, all illustrate Ktima secondary school. 6, south wall of squared limestone to practical rooms. Small windows provide cross-ventilation only, the main windows being to the north. 7, north elevation, cantilevered access verandah before fixing of balustrading. Infill panels are of grooved hollow clay partition blocks, left unplastered. 8, staff room, with south elevation behind.

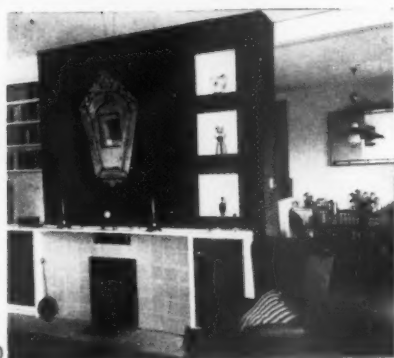


9

HOUSE IN REIGATE

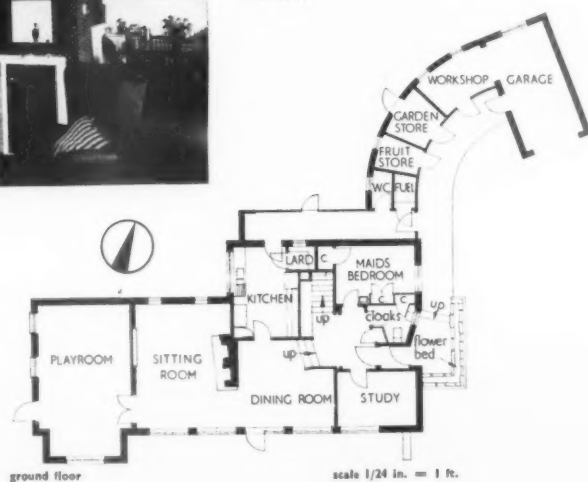
ARCHITECT, JOHN R. STAMMERS

This house, in Alders Road, Reigate, was required to give accommodation for a family of six (four children) and a maid. It is sited on a former tennis court which, together with a large oak tree, was the chief feature of the rectangular one-acre site. To face south, the house is at an angle to the site boundary; but the garage is parallel with the (east) boundary and is linked to the house by a curving set of outbuildings. Ground floor external walls are cavity brickwork, painted white externally and with a black plinth and first floor walls have two skins of clinker blocks with external facing of red cedar boarding. The ground floor is concrete with a waterproof membrane and screed. Heating is by cables embedded in the screed with access panels and thermostat control in each room, except in the living room, where there is an open fire; expanded metal fixed over the conduits before screeding spreads the heat evenly.



10

9, south front of the house from oak tree. 10, the living room, which is the only ground floor room with an open fire, and not using electric floor heating system. The carpet is laid directly on to the screed.



The name miscellany implies, of course, an architectural miscellany—one that will include subjects which, though marginal to architecture, are nevertheless vital to it.

miscellany

EXHIBITIONS

PAINTING

The Parisian action painter Georges Mathieu, working somewhere in Kensington, 1, produced several large paintings in two days so that he could hold a one-man show at the ICA Gallery without importing

works from France. This does not mean that the pictures were painted in a hurry or were below Mathieu's usual elegant standard: the largest picture in the exhibition 'The Battle of Hastings,' (right) was an unusually considered work, for whereas in Paris his time for a picture 36 ft. by 12 ft. is twenty minutes, he was engaged on his English battlepiece, which was only 15 ft. by 6 ft., for the best part of two hours. The crisis in its conception came at four minutes past six on June 23rd when Mathieu was heard to say: 'Now is the difficult part,' and spent three minutes working on a red calligraphy with a brush, but everything came out all right, and the picture was completed at 6.53 with a big fat squirt of white, straight from the tube. The ICA entered into the spirit of the game by referring to 'The Battle of Hastings' as a work in which Mathieu's 'audacious and controversial mixture of action painting and feudal history converge,' and no doubt hoped to provoke angry comment from the friends of The Bayeux Tapestry.

If I am less interested in the paintings than the fascinating documents connected with them, it is because the paintings seem to go cold and passionless immediately the painter has finished with them, and by the time they reach a gallery appear to be no more than the melancholy mementoes of a calculated bout of hysteria. Mr. del Renzio, in a lofty introduction to the catalogue which was probably written in an aeroplane, since the words 'Turin, Rome, London' are printed under his name, remarks that Mathieu paints without the aids or 'props' needed by such men as Raphael, Cézanne and Picasso, and adds that 'his style resides in a convulsive lyricism.' But Mathieu's prop is Chinese calligraphy, and if he needs nothing more it is because he considers that his autograph, extrav-



agantly elaborated and magnified, is enough. What Mr. del Renzio calls his 'convulsive lyricism' is in the act of painting rather than the result, and he can therefore be more correctly described as an action painter than any member of the New York school.

Among the photographs of Mathieu at work, dressed in his 'painter's set,' there is one in which he is just a blur because he is twirling round at great speed before taking aim at the canvas, and I think that if he could be persuaded to give public performances he would make a great name for himself in the field of popular entertainment. The symbolic nature of his actions would be quickly understood, and Sir Herbert Read's description of his 'signature' as a 'sepiaceous ejaculation' would no longer sound difficult and high flown, although the greatest applause would inevitably be reserved for the climactic squeeze from the big tube of white.

Picasso, with his immense facility, knows the temptations of this world of graphic exhibitionism, and has not

infrequently yielded to them. The film in which he draws on the air with a pencil of light is thrilling and unforgettable, but when such an act is over and only the outline it has left behind is with us, it can be unmistakably and inimitably the line of Picasso, and, at the same time, a spiritual blank. There were a number of sheets in the retrospective exhibition of his prints at the Arts Council Gallery, in which the subject was merely a pretext for a display of virtuosity, and put in an appearance only as something emptied of meaning; but there were many others in which his brilliant and arbitrary linear inventiveness seized upon a living presence with protective magic, as in the marvellous lithograph of his daughter Paloma holding a doll, 2.

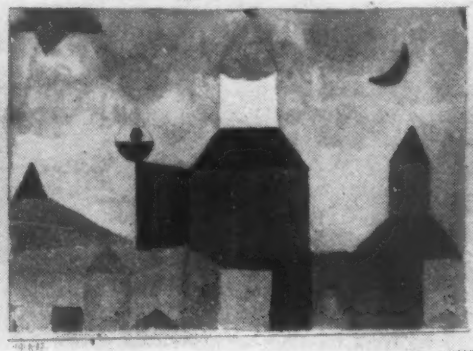
After looking at first-rate Picassos, one can find Paul Klee* a bit too oblique and fanciful and off the main course, but the exhibition of his work recently held at the Hanover Gallery was powerful enough to dictate its own terms of reference

* See the article on Paul Klee by Robert Melville on pages 145-149 of this issue.



2

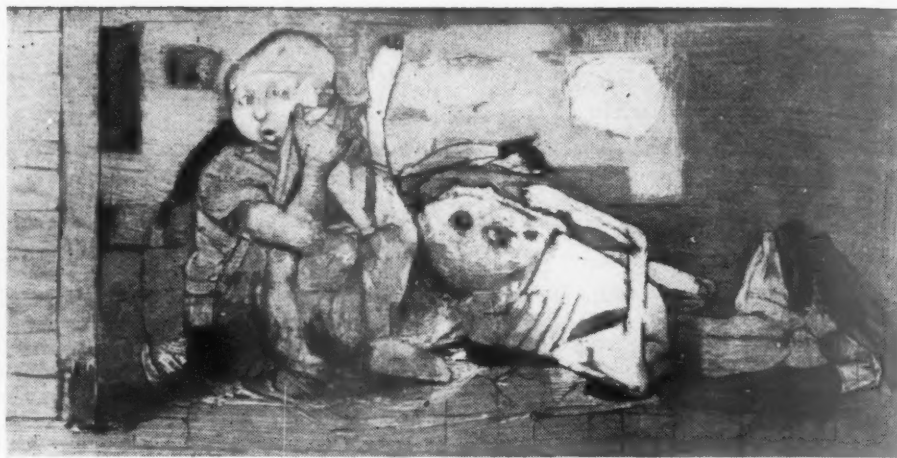
to the visitor. There was no trace of virtuosity for its own sake, but everywhere a smiling yet desperately serious intention to lay before us the haunting evidence of a thousand unknown worlds that his sharp eyes first detected under the point of his pencil, and which he coaxed right out into the light in some



3

of the most beautiful watercolours ever achieved outside the Orient, 3.

Paul Rebeyrolle, the erstwhile realist, has re-emerged in an exhibition at the RWS Gallery, organized by Marlborough Fine Arts, as one of the most accomplished decorative painters of our time. In his panels of espaliered walls he brilliantly exploits the current feeling for *art nouveau*; in his delectable paintings of trout hovering in light-stained water he uses tachist techniques with a consummate professionalism; in the series devoted to peasant children grieving over sick or dead animals, 4, he alludes to the ugliness and misery, but without pity, and the mannered draughtsmanship and tasteful colour preserve the decorative intention. Lovers of the art of Frank Brangwyn will, I hope, be pleased to know that his flair for keeping reality at arm's length has, if any-



4

thing, passed into even more capable hands.

Utrillo's mother, Suzanne Valadon (1867-1938) was a crude and heavy-handed painter, but the group of paintings and drawings recently exhibited at the Lefevre Gallery was nevertheless full of friendly vitality, and her tough, prole-



5

tarian little picture of bathers, 5, which is evidently painted in a spirit of homage to Puvis de Chavannes, unintentionally takes the micky out of him in a way that would have delighted Toulouse-Lautrec.

Patrick Heron is rather unexpectedly trying to become an action painter of the 'abstract impressionist' variety, and the first results, 6, recently shown at the Redfern Gallery, are so much more charming and decorative than anything he has exhibited before 6 that one cannot but applaud his decision. But the paint is so bodiless and the paint-strokes so lacking in fervour or thrust that he would be well advised to study Mathieu's assault tactics and take an occasional running jump at the canvas.

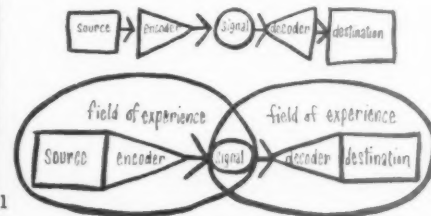
Robert Melville

THIS IS TOMORROW

The synthesis of the major arts is a consecrated theme in the Modern Movement, one of the shining abstractions that gather, halo-wise,

*about the heads of its Masters, though it has been left mostly to their followers to thrash out the practicalities that stand between wish and achievement. The most used threshing-floor so far has been CIAM, but a new and most instructive one has been provided lately by the exhibition, unfortunately labelled *This is Tomorrow*, which continues at the White-chapel Gallery until September 9.*

Collaboration between practitioners of the different arts was its only set programme; its aesthetics were entirely permissive, and anything could, in theory, have been done. The results were inevitably diverse, but so were the premises from which different groups of collaborators worked. Even the idea of synthesis was interpreted, at one extreme, simply as a requirement to house or decorate one another's work, and at the other extreme, as an invitation to smash all boundaries between the arts, to treat them all as modes of communicating experience from



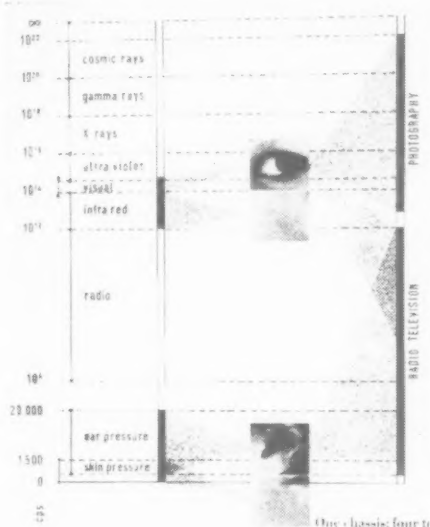
person to person, 1, as the Holroyd-Alloway-del Renzio* group did—modes that could embrace all the available channels of human perception, as set out in a table, 2, which appeared in the catalogue entry for the Voecker-Hamilton-McHale section.

But even if the concept is as wide and fluid as this, practical considerations tend

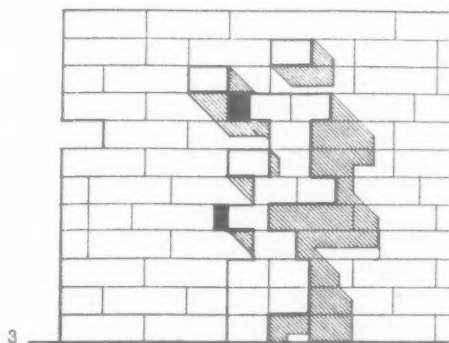
* The names of the architects are given first for each group.

to reduce the means employed to a set of recognizable elements, classifiable under the heads of Structure, Plasticity, Symbol and Sign, even if pictures were merely hung on a wall these four elements were all employed, if only accidentally.

Some concept of structure—geometry clothed in substance—proved to be the basic, or unifying postulate of most groups' offerings, and in one case, the partnership of John Weeks and Adrian Heath, structure was the totality of the exhibit, a wall of standard bricks



2

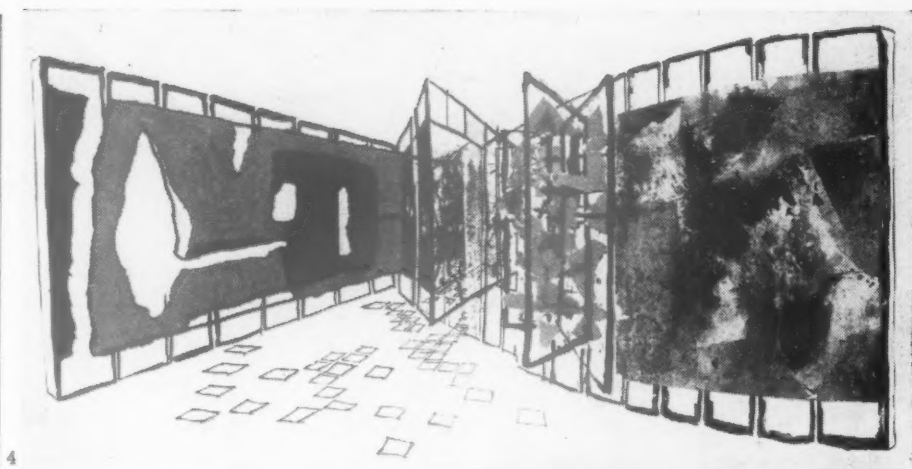


3

which were displaced or omitted, 3, to give it the plasticity and symbolic significance of an abstract sculpture.

More complex structure-sculptures were seen in the Catleugh-Thornton-Hull screen, 4, but a note of ambiguity, more consciously exploited in other sections, appears in the composition of curved planes on which Peter Carter, Colin St. J. Wilson and Robert Adams collaborated. Normal scale-effects are reversed, and that part which is large enough to admit a standing man, 5, is clearly sculptural in feeling, while the manifestly structural element beyond is sited and displayed like a free-standing statue.

This ambiguity was part of a general feeling of broken barriers and questioned categories that constituted the most



4

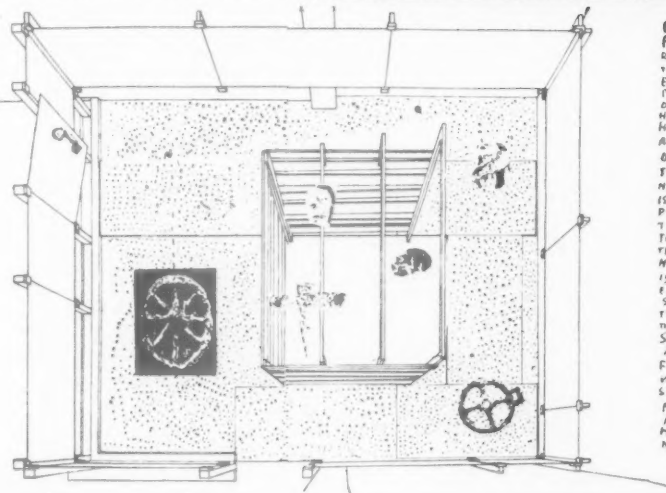
stimulating aspect of the whole exhibition. And yet the technique of category-smashing could not be used as a basis for forming value-judgments about the exhibits. Thus, the Smithsonian-Henderson-Paolozzi contribution showed the New Brutalists at their most submissive to traditional values. They erected a pavilion within a patio, 6, and stocked it with sculptures signifying the most time-honoured of man's activities and needs.



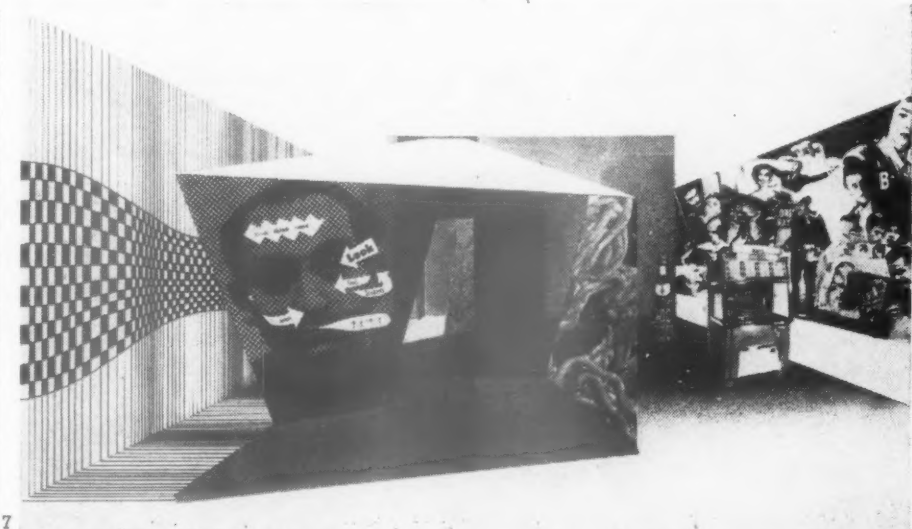
5

Patio & Pavilion

6



PATIO & PAVILION
REPRESENTS
THE FUNDAM
ENTAL NECESSITIES
OF THE
HUMAN
HABITAT IN
A SERIES
OF SYMBOLS
THE FIRST
NECESSITY
IS FOR A
PIECE OF
THE WORLD
THE PATIO
THE SECOND
NECESSITY
IS FOR AN
ENCLOSED
SPACE
THE PAVILION
THESE TWO
SPACES
ARE
FURNISHED
WITH
SYMBOLS
FOR
ALL
HUMAN
NEEDS



7

This was, in an exalted sense, a confirmation of accepted values and symbols.

Voelcker, Hamilton and McHale, on the other hand, employed optical illusions, scale reversions, oblique structures and fragmented images, 7, to disrupt stock responses, and put the viewer back on a *tabula rasa* of individual responsibility for his own atomized sensory awareness of images of only local and contemporary significance. Yet, curiously, their section seemed to have more in common with that of the New Brutalists than any other, and the clue to this kinship would appear to lie in the fact that neither relied on abstract concepts, but on concrete images—images that can carry the mass of tradition and association, or the energy of novelty and technology, but resist classification by the geometrical disciplines by which most other exhibits were dominated.

Reyner Banham

TOWNSCAPE

TOWNSCAPE IN SCHOOLS

Townscape studies are, alas, not part of the normal curriculum of secondary schools, nor would Bishops Stortford be on anyone's short list of England's most promising towns.

It is an unusual concerted achievement of master (at Bishops Stortford College) and pupil (Christopher Hewett), to have produced two studies of Bishops Stortford from which the following extracts are taken. Both contain food for thought: the first is a study of a tangle of nineteenth-century speculative workers' housing, the sort of thing that John Betjeman brought back to people's notice but which has since been discarded in favour of more incense-laden or patently nostalgic Victorian:—

'Inside the rules of proportion that the Victorians imposed or rather found imposed upon themselves, they used their bricks and colour to the greatest advantage. It is a mistake to consider them lacking in imagination and audacity. One house in Jervis Road, for instance, has "1891" sprawling across its façade in bright red. They would paint the Georgian camber arch in the brightest of colours, or press patterns into them. Not content with this, they would occasionally introduce a moulded pseudo-medieval head into their keystones.

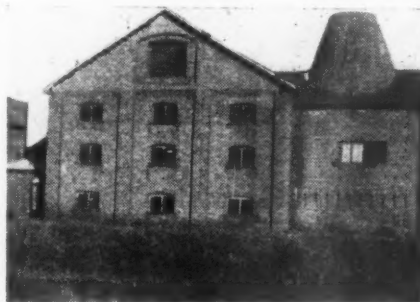
'There is a wealth of detail to be found in every street of the area. It might be a Victorian post box, street lettering, an interesting window surround, 1, or a carving. No buildings, not even the



very latest ones, are completely devoid of detail, for if there is no carving, red bricks look well arranged in patterns against the pink flettons.'

The other is a study of what any borough surveyor, and most town planners, would throw away without a second look—the industrial jungle along the river Stort—

'Those who go about condemning nineteenth-century architecture should



be careful, for in this simple, non-committal building lie the roots of modern architecture. Once our forefathers let slip the mask of pretentiousness, and concentrated on producing buildings that did not pretend to be anything more than they were, the results were buildings like this one, 2, dignified, efficient and beautifully proportioned.'

and also...

'A little further down is another gasometer. The water and the wide stretch of ground afford a fine setting for this group which is given scale by the allotment sheds'

... which is further than most REVIEW readers would be prepared to go. Yet it is a just observation, more relevant to the landscape problem of, say, the Lea valley than an artful lake with yachts on: the sort of observation that only seems to come from primitive or newly-awakened vision. It is certainly vital to the English landscape that as many people as possible should go into their careers with their eyes wide open in a sense quite different from the normal admonitory one.

G. Moncur

PHOTOGRAPHY

JOHN DEAKIN'S PARIS

Advertising has become a kind of universal solvent, that can carry sacred and profane as easily as art and non-art, and John Deakin's Paris, a recent exhibition of the work of an English photographer in Paris, provided some striking images of the solvent at work transmuting and

inverting values. The giant aperitif advertisement is, a Paris constant (AR, December, 1952), and in Deakin's viewfinder it dominates the scene with the crumbling permanence of an ancient monument, 3, while three priests pass below, transient elements in a scene where *l'Eglise passe, Suze reste.*

Or a sacred iconography—if not an edifying one—may emerge from the 'accidents' (AR, February, 1956) of commercial strategy. The coy bust in the hairdresser's window must turn at least full profile to the passing world outside to show the coiffeur's art, 2, but in doing so she confronts two pop-eyed messieurs, whose expressions would not look half so appreciative if they did not find themselves in this Susannah-and-the-Elders tableau—staged, rather appropriately, within a glove's drop of Colette's old flat. But the solution of art in advertising does not wait on accident; the entrance to the old *Enfer* night club, 1, is a kind of salmagundi of world art. Whoever cooked it up has helped himself liberally and deliberately to Michelangelo and Rodin, Bomarzo (AR, September, 1954) and the Palazzo Zuccaro, Daumier, Doré, Notre-Dame, Chartres—a complete demonology, and to the size of life.

Michel Santiago

OUTRAGE

LANDSCAPING AT CANONBURY

Commerce and the demands of domesticity nibble at the countryside: in the Canonbury district of Islington nature hits back. The astounded visitor to this urbane neighbourhood sees the formal Georgian terraces across what appears to be a volcanic outcrop of Westmorland limestone. The bizarre effect is increased by the whiteness of the stone, proof that unspoiled nature rather than the Georgian builder is the newcomer. What on earth has happened here?



1

John Deakin's Paris Three visions of the Sacred and the Profane in Paris advertising. 1, the Gate of Hell, the old Enfer nightclub in Montmartre;

2

2, Susannah and the Elders in a hairdresser's window in the Palais Royale;

3

3, piety passes while aperitif persists, a wallscape near Montparnasse.



The two pieces of open space 'landscaped' in this way are the triangle between Canonbury Road and Astley Row, and the site of what used to be the New River.* When the Metropolitan Water Board deflected this stream three years ago the Borough decided to keep a serpentine stretch of water on its course behind Alwyne Villas, and lay out its banks as a small park. Elsewhere it was necessary to make decisions about the layout of the odd spaces humped over air raid shelters and squares whose railings, an integral part of their design, had gone for scrap. Islington set about this task with zest and imagination, though unfortunately without sufficiently mature aesthetic advice.

This Borough has to battle with a formidable blanket of dirt as well as social decline. It is not in the least surprising that the landscape most desirable to Islington eyes is the one most foreign to Islington. What is deplorable is that everyone concerned should have been blind to the quality of the surrounding architecture. This is hardly excusable, since at the very time when Mr. Frederick Vanstone was transforming the triangle by Canonbury Road a wholesale change of ownership was taking place in the Square just round the corner. Even those blind to architecture must have pondered on the reason for the Square's rehabilitation.

One salutes the audacity of treating a single acre deep in London in the manner of the wildest fells. The idea has the boldness and its treatment the simplicity of art. One essential ingredient of art is lacking, a sensitive eye for detail. To carry an outrageous idea like this through to success would demand a great capacity for dealing firmly with detail. Without this inconspicuous talent such boldness is simply outrage. The rocks themselves do not insult the dignified houses in the



background, 1. It is the small brick structure housing goodness knows what in the foreground that gives the game away. This is not treated either in the late

* And Colebrooke Row is receiving the same treatment.

Georgian or in the Westmorland manner. It is not treated at all. The designer of the landscape, lacking the skill to work such inconvenient necessities into his scheme, has assumed that they are invisible. Such an attitude relegates the scheme to the status of a 'contract'; it is not a design at all. Anyone may think up grandiose ideas. When local authorities assign large sums to the improvement of valuable open spaces they should entrust the work to someone with eyes to see both beauties and eyesores.

The layout on the New River site confirms this view. The suspicion of in-



competence raised by that tell-tale brick box is here amply justified. The idea of the rock-strewn turf, 2, has a simplicity that commands respect, even from its opponents—those people who would prefer a layout in keeping with the surrounding houses. The trouble started as soon as the designer came up against the realities of urban design, necessary walls, gates and buildings. Even the problem of a gate into the park had not been taken into account. Logically there should be rough-hewn posts and a field gate. Or it would have been reasonable to do the necessary walling in the Canonbury style. The landscaper was too proud to adopt this course. Unfamiliar perhaps with the contemporary urban style, he was not able to call this to his aid. Of all the possibilities the one adopted is the most uninformed, the most vulgar, and alas the most usual; it is the eighteenth-century Cotswold style, 3. Too desperate to take a cue from the meander-



ing lines of the waterway the director of this curious enterprise has conjured round the gateway an arbitrary axis built up of nothing and leading nowhere, or to be more precise made up of garden seats and leading to the gardener's shed. It is doubtful whether the people who come to enjoy the freshness of the pool and turf will relish sitting in a tight line and looking at each other.

In Canonbury Square the layout has taken rather a different turn. The result, not so near a miss, is not so obvious an outrage. The outrage only consists in comparison with the original simplicity of Georgian squares, tall trees and smooth turf outlined by a plain railing. Here in a quiet way, almost everything possible has been tried. The Canonbury Square, from which the railings were taken, was an area in social decline. When the time came for a post-war layout it was restored to something like its original quiet prosperity. The new residents were extremely articulate, some embarrassingly influential. In spite of a general fondness for Georgian architecture there was a widespread consciousness that something more creative was expected of them than dogged restoration. The proper person to reconcile these conflicting views is an architect, aware of the historical implications but trained to see the over-all picture. Highly educated people, however, do not allow that in aesthetics also education is essential. Canonbury Square is a monument to the Committee principle. Every detail has been considered, and included.



Those wanting eighteenth-century formality have an imposing build-up of flower beds, 4. The no-nonsense school has triumphed by keeping the fence of concrete and chicken-wire, 5. The preservationists have their elegant keeper's hut; the realists have a little gate to keep the dogs off the flower beds, 6. The only section not to be consulted were the Georgian houses themselves; and as soon as they are considered the problem moves from interesting farce to minor tragedy. Islington is the last coherent piece of this sort of urbanity in London, not a carefully



preserved fragment but a sequence of squares and streets; enough for a day's walk if you wish it. The houses are probably better kept up than at any time in this century; it is a sad irony that in the same decade that has seen the preservation of the parts the effect of the whole has been thrown away with the best of intentions.

Diana Rowntree

TOPOGRAPHY

FRITH AND THE IRREGULAR

If William Frith is coming into his own again, the reason is not only Victorian Revival, in its gratifying and irritating implications, but also the fact that we begin to see him as considerably more than a meticulous recorder. The best proof of his accurate sense of atmosphere, mood, character is the architectural parade at the back of *Ramsgate Sands*, often overlooked by those caught in the many incidents in the foreground. This procession of modest buildings is curiously English, in its total absence of uniformity, even of level, and its emphasis instead on a general sympathy of a building with its neighbours, and of groups of buildings with each other. *Ramsgate Sands* was painted in 1853. Ramsgate had been developed as a seaside resort chiefly during the first half of the century. The key to the buildings is this:*

The Clock-House in Pier Yard on the extreme left dates from 1815. The engineer in charge of work on the pier was Rennie. To the left of the Obelisk is the Royal Hotel, built in 1844-45. The Obelisk commemorates the visit of George IV to Ramsgate, September 21, 1821, to embark for Calais and Hanover, and his return during the following November. It was designed by John Shaw, architect of St. Dunstan's, Fleet Street. To the right of the Obelisk is the Harbour Master's and Customs House of 1800-1815. The castellated building dates from shortly after 1823 and is known as Pier Castle. At its feet are the offices and cells of the harbour police. Kent Terrace, in the centre

* The information which follows was kindly checked and augmented by B. C. Darbey, the Borough Librarian.

of the picture, was built in 1833-37, the scheme being no doubt encouraged by what was being done in other seaside places at the same time. Towering above Kent Terrace is Albion Square (now Albion Place), begun in 1789. Albion was especially popular for street names, etc., at that time (compare for instance with Albion Hotel, Brighton, built in the twenties). To the right of Albion Square follow East Cliff House, c. 1823, and Well Crescent, 1819-22. The designs seem to be by Pilcher Longley, a carpenter, and one Smith, a builder.

Today of these buildings the following no longer exist: the Royal Hotel, which was pulled down in 1938 and set back some twenty feet; and the Harbour Master's house and office, the Customs House, and the offices and cells of the Harbour Police, which were all demolished in 1895 to widen the road leading to the London, Chatham and Dover Railway.

Nikolaus Pevsner

HISTORY

TIME MADE VISIBLE

If there is one thing that distinguishes our age from all previous ages it is surely the acuteness with which we are aware of our relationship with the past, of our precise position in the stream of time. In short, we possess an unprecedentedly well-developed historical sense.

Now there are people who deplore the effect of this possession on the practice and appreciation of the arts. So far as the practice of the arts is concerned, they are demonstrably wrong: revivalism and eclecticism are not products of the historical sense, but of knowledge of the past in the hands of those in whom the historical sense is not fully developed. When it comes to the appreciation of

A detail from William Frith's *Ramsgate Sands* which was painted in 1853 and is commented on under 'Topography'.





objects with a life of their own. Nevertheless, the historical sense is by no means necessarily an enemy of the visual; the two can, and often do, combine to enrich our total experience. What is our appreciation of the quality of pleasing decay if not the result of their so combining?

The standing stone at Avebury, in the first photograph, is a monument which moves us as deeply as it does because its great age is so clearly expressed in its weathered surfaces. Imagine it 'restored'; how much would it move us then? The answer is not at all, however much the antiquaries talked about its age and 'importance.' But it is unthinkable that it should be restored. Yes, we can see that when a single stone, or a circle of stones, is in question: when a building is concerned we are sometimes rather less willing to accept time's contribution as the enhancement it so often is. Yet there need be nothing exclusive about a feeling for pleasing decay: an appreciation of the weather-worn grandeur of the Avebury stone need not blind us to the other kind of grandeur, the grandeur of geometrical precision, belonging to the sea-mark on Portland Bill in the second photograph. There is a place in the scheme of things for precision as well as for decay—though not for the lifeless precision of the surfaces and mouldings of the old building which has suffered at the hands of those for whom neatness is all.

Andrew Hammer

POPULAR ART

MELBOURNE IRONWORK

Melbourne put on most of her ironwork in those madly gilded years between the gold-rush and the land-

bloom. A generation of builders riding the crests of successive economic waves had to provide for a population which grew after 1851 from just over a handful of dusty pioneers to just under a million desperate sophisticates. Iron fitted into this second half of the nineteenth century in many forms. On the upper crust, big buildings for the Government and the commercial barons were extravagantly hand-wrought on the surface in nobler materials—marble, mosaic and parquetry—but occasionally they made daring use of iron stanchions and framing in the concealed structure. The frankly decorative iron appeared mostly in the pie-filling between these classes, in the rows of two-storey terrace houses, the single-storey 'gentlemen's residences' and the suburban residential shops.

These buildings were simply planned and



Four cast-iron Melbourne balconies; 1, offices in Victoria Parade; 2, St. Patrick's Boys' College; 3, house in Drummond Street, now painted mustard, black and white; and 4, a terrace at Carlton.



works of art, it is easier to make out a case against the historical sense; for in those in whom another sense, the visual, is undeveloped, it breeds that kind of pedantry which sees works of art solely as pieces of evidence relating to other forms of human activity, and never as



mostly well built of bricks and the dark blue basalt from beneath the town. They were essentially plain buildings more or less in the tradition of the half-century-older colonial Georgian of New South Wales and Tasmania. After they were constructed and finished with smooth stucco and neat double-hung windows, the cast-iron ornamentation was drawn over the front like a veil hanging from the brim of the hipped slate hat, 1-4.

Decorative cast-iron appeared in other places of course, around mantelshelves and mirrors, as applied balconies, memorials, in hallway openings and on towers and domes, 5. But this facial veil was most characteristic of Melbourne. It stood clear of the building at the front edge of a shallow verandah, the whole thing an almost independent structure under its own little skillion roof. The iron lacework was frankly two-dimensional, frivolously non-structural, a stage drop-curtain in front

of the real solid building. The iron of older Sydney was often heavier, more solid, or curved; the verandah was integral with the building; the columns were of considered and conventional proportions—today you must tap them to discover whether stone, wood or iron hides behind the paint. Melbourne's columns were unquestionably iron: thin, fluted cast-iron pipes one storey high, with a slight taper finishing about three and a half inches thick beneath the grotesque cast capitals. These were some ten inches across and vaguely Composite or Ionic, the overgrown volutes staring like a possum's eyes across the narrow garden to the street.

The columns were closely spaced and the main decoration sprouted above the capitals, lacy cast-iron doyleys fanning out from each side to meet in a transparent impression of an arch. On two-storey buildings a filmy arcade was thus formed at first floor and roof levels, and the posts were linked again by a wide lace ribbon that was the balustrade to the first-floor balcony. The pieces of the lace were small and easily handled: triangular for the angles between posts and beams, straight frilly rails to be draped from the beams, square panels to make up the balustrade, all cast with screwholes at the edge for simple connection to the timber bressumers. At the beginning most of the flat pieces came packed in straw from England as convenient ballast deep in the holds of the light sailing ships. Two Melbourne foundries, Fulton Bros. and the Langland Foundry Co., were apparently producing numbers of cast-iron columns in the late 1850's. Then flat pieces were also cast in Melbourne, at first from impressions of the English models, mostly Acanthus and wheel patterns, and then from less restrained local designs. By far the most productive period was between 1880 and 1891. The motifs then were usually stiffly and confusedly geometric, with many floral offshoots and, rarely, touches of local colour in small panels. The Victorian and Melbourne coats-of-arms, the tree-fern and wattle, the wallaby, lyre-bird, kookaburra and other local inhabitants made obscure appearances in the rough castings.

An extraordinary thing is the apparent lack of repetition. You may drive for miles round Melbourne's inner suburbs and not be conscious of seeing any lace design twice. The details, however, could hardly have interested anyone at the time except the bosses of rival foundries. Surely no-one else was enchanted enough to peer into the tangled veil. All that mattered was the outline which stood in perforated silhouette against the plain wall behind. Coarse edges and minor breakages would never be noticed. Only an intricate division

of solid and void in equal measure was important, and this cast its fragile shadow over all the city.

The era finished with the slump in the grey 'nineties. At the end of the century a brief epilogue was added in the form of some Art Nouveau wrought-iron entwined round columns and balustrades where the cast-iron used to go, 6. Then iron of any sort gave way to wooden fretwork and for nearly half a century cast-iron was ostracised from popular decoration. About 1988 people began to discover how simply the iron could be detached from verandahs and how unnecessary were the verandahs anyway. The standard way to renovate an old building was to unhitch the whole veil and expose the bland face behind.

The pendulum today is swinging back again. The plain 'Colonial Georgian' is now lower in the decorator's esteem than the Victorian Look. Sometimes now an old house will buy cast-iron back from the wrecker's yard and use it in unlikely positions with ludicrous effect. On the other hand, increased painting and heightened colour on the terrace-houses in the inner suburbs where the cast-iron veils abound indicate that more and more people now are intelligently accepting this amiable adornment in the spirit in which it was originally offered.

Robin Boyd

BOOKS

CONTRARIWISE

THE ENGLISHNESS OF ENGLISH ART. By Nikolaus Pevsner. The Architectural Press, 16s.

'Rome or France or Bolshevik Russia or Republican America,' Chesterton once observed, 'each in its own way, is a principle; but England is a person.' This is as true as anything that has ever been said on the subject, and we have only to suggest that there is no such thing as 'a' person to see how impossible it is to generalize effectively about such a country. A person may be an introvert or an extravert, and if we multiply distinctions in the Jungian manner, we arrive at least sixteen, possibly thirty-two, even sixty-four, distinct types of personality, each with a characteristic mode of expression, each English. This may explain why the English traits of English art, as described by Dr. Pevsner, are so apparently contradictory—'eccentricity' cancelling out 'distrust of the extreme,' 'the picturesque' at war with 'compartmentalism,' the 'undulating line' defying the 'emphasis on verticals,' 'small scale' in conflict with 'excessive length and height,' and 'illogicality' triumphant over 'reasonableness and good sense.' A timid scholar would not attempt to reconcile the Lion of our strength and fortitude with the



Unicorn of our imagination and fantasy. But it is a mark of the perfection of the process of assimilation achieved in twenty years by this Saxon born *Kunsthistoriker* that he can not only accept our illogicality: he can himself be as illogical as any true-born Englishman—taking, for example, a Scot like Robert Adam to illustrate the 'tender curves' of our eighteenth century elegance. The book is, in fact, a glorious jumble of conflicting observations, and a conspicuous defeat for the imported pedantry that threatened for a time to overwhelm our native nonsense.

Among the many virtues of Dr. Pevsner's approach to the subject may be mentioned his easy command of technicalities, especially in the subject of architecture; indeed, there he is in danger of confusing structural solutions with æsthetic virtues, as in his undue devotion to the Perpendicular style of architecture. It is true that he regards this style as the triumph of the rational or the reasonable over the idealism of the Middle Ages, and then denounces rationalism as a middle-class ideal. But he might, with equal justice, have described Perpendicular as the beginning of Puritanism, and Puritanism as the temporary extinction and all-time depreciation of art in England. Indeed, Dr. Pevsner is all too tolerant of that devastating episode in the history of English taste, a veritable visitation of the Huns and Vandals from which our artistic life has not yet recovered.

The outstanding characteristic of the British (a term any true-born Englishman resents, though it is not so objectionable as 'Briton') is that they are, as Ruskin said, of all northern races, 'the one which has the deepest love of external nature.' This love is probably induced by climate and landscape, and on these strictly materialistic grounds, and only on these, we may safely generalize. Ruskin also remarked that British art was never *sublime*, which would be consistent with our extravert tendencies. English Gothic, at Durham, Lincoln and York, is perhaps a contradiction of this observation, but Ruskin was not considering architecture. Even Blake, who as Dr. Pevsner recognizes, is in total contrast to all other English painters, is not sublime, in the sense that Tintoretto or Michelangelo were sublime. His mysticism is domesticated. But Blake 'knew of the importance of polarities,' which he called Contraries. And it is to the contrariness of English art that we finally come; and 'The Contrariness of English Art' would really have been a better title for this delightful book. Dr. Pevsner loves our contrariness, and explicates its exasperating quirks with cool knowledge and lively sensibility, and with a tact that would become an ambassador to the Court of St. James. A special word of praise should be added for the 130 exceptionally well-printed half-tone illustrations.

Herbert Read

PROBLEMATIC GIBBS

THE LIFE AND WORKS OF JAMES GIBBS.
By Brian Little. Batsford, 25s.

Reading Mr. Little's book on Gibbs, one can well understand why this eminent

architect had to wait 200 years for a record of his life and work. After Wren, Gibbs was certainly the architect who left the strongest mark on English architecture: many of his buildings stand on prominent sites, several of their features were widely imitated and his architectural publications served as pattern books for many decades on both sides of the Atlantic. Yet his life story, at least as far as it is known, lacks the intellectual interest of Wren's or the romantic touch of Vanbrugh's; in fact the story of his life makes dull reading, although Mr. Little has considerably added to our knowledge and taken great pains to clear up many dark points. Thus his explanation of Gibbs's interest in Portuguese history as rooted in his Roman days is completely convincing. The same, unfortunately, cannot be said of the building histories of Gibbs's works.

Here Mr. Little has left us much where we were; in fact he has not even assembled all that is known. Yet it is not mere pedantry to ask for more precise accounts, especially where he superseded another architect. Here one can only appreciate the master's contribution if one knows accurately what happened at the moment of the change-over.

Again, it is only when the authorship of what must have been an early site plan for St. Mary-le-Strand has been established that Gibbs's role in siting the church can be estimated. That Mr. Little has fought shy of the vexed problem of the plasterers Artari and Bagutti—whether they themselves were the designers or whether they only acted as craftsmen—is quite understandable, however sorry one may be for it; it can only be hoped that one day somebody will try to clear this question up. The same is true of Gibbs's collection of drawings and prints now in the Ashmolean Museum, a large number of which are not by his hand; an investigation here might well yield surprises.

It is only after all such questions have been answered that a catalogue of Gibbs's *œuvre* could be compiled. Mr. Little for all these reasons has not attempted one. Perhaps he can not be blamed for that, but he should surely have given his readers a valuation of Gibbs's style, in comparison with the styles of contemporary architects at home and abroad.

S. Lang

FRENCH CANADIAN

CHURCH ARCHITECTURE IN NEW FRANCE.
By Alan Gowans. University of Toronto Press, \$8.00

Mr. Gowans has given us a most comprehensive and fully-documented study of the chapels and parish churches of what was, between Champlain's foundation of Quebec in 1608 and Wolfe's victory in 1759, New France; that part of the present Province of Quebec along the St. Lawrence river colonized from France and based on the three cities of Quebec, Trois-Rivières and Montreal.

As the author points out, there are very few extant buildings in the Province dating from before 1760; and of these few hardly any remain unaltered. The combined effects of the Seven Years' War, of nineteenth-century

rebuilding and of recurrent fires have left little but documentary evidence. Such evidence however, is fairly plentiful, from the *Plan générale . . . des missions du Canada* of 1683; through the admirable drawings of Richard Short, one of Wolfe's officers in 1759; to nineteenth-century photographs of churches now demolished.

Mr. Gowans's extensive and scholarly research has resulted in a clear exposition of a very complicated series of relationships, both between the French hierarchy and the missions, and between the parish priests and the religious orders, especially the Jesuits and the Sulpicians.

The author traces the development of church-building in New Quebec, from the pioneer Heroic Period in the early seventeenth century, with the tiny mission chapels built of bark and branches, through the absolutist rule of the great Bishop Laval under Louis XIV, down to the age of Louis XV, when New France had become *canadien* and was producing its own version of the Norman-Breton traditions of its ancestors. From that tradition come the impressive twin-towered churches that are such a marked feature in the Province of Quebec today.

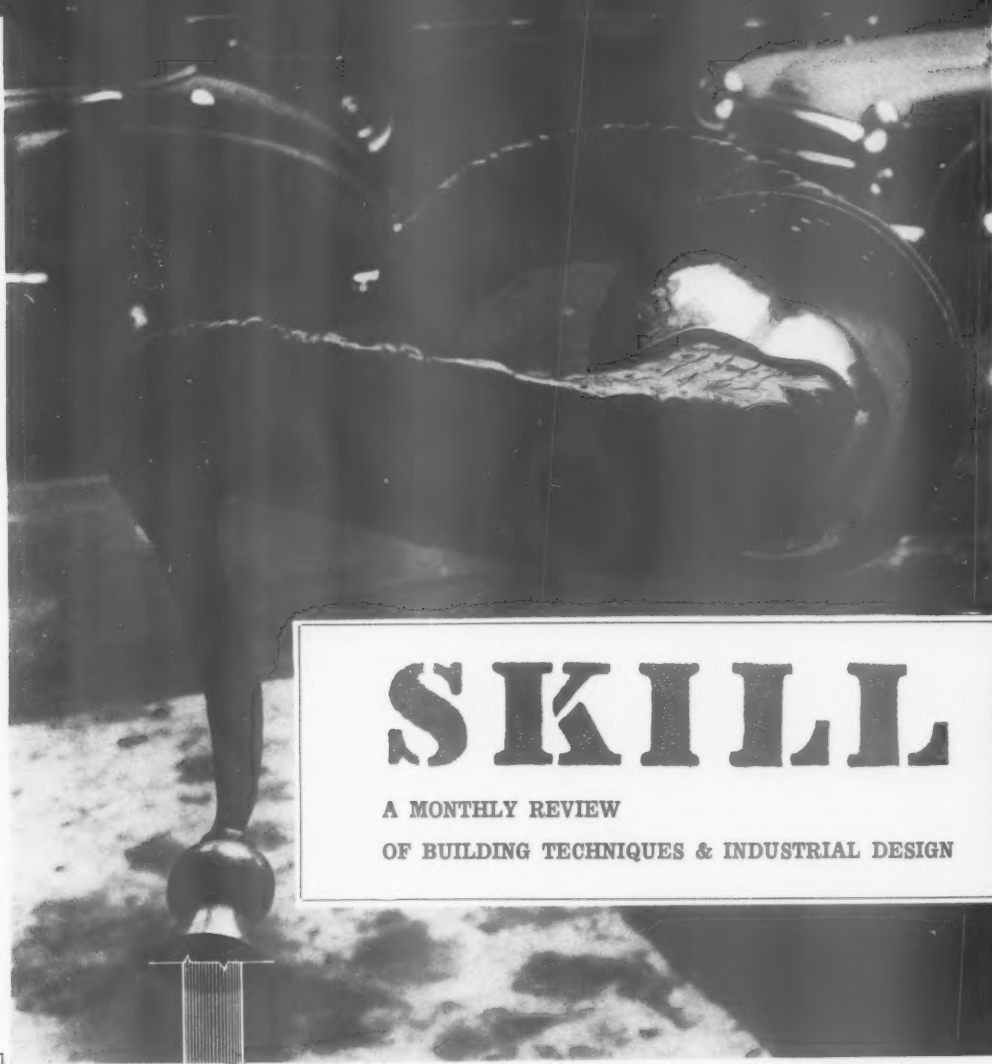
Remarkable evidence of applied learning is provided by Mr. Gowans's chronological catalogue of churches built in New France between 1615 and 1756. This, compiled from many sources, must long remain the standard reference for explorers in this very limited field. This is primarily a specialist's book. At the same time, it is quite an illuminating contribution to French-Canadian history in general. Although French-Canadian scholars have done so much research on the subject, it has been left to a British-Canadian to produce this timely and comprehensive study of the story as a whole.

John Steegman

Shorter Notices

YORKSHIRE REVEALED. By G. Douglas Bolton. Oliver and Boyd, Edinburgh, 25s.

Mr. Douglas Bolton's book is a brave attempt to present the whole of this very large and varied county within the covers of a single and not-too-bulky topographical guide book. In his introduction he says: 'My aim is to try to reveal Yorkshire and give just enough information about the scenery, architecture and history to encourage a series of tours covering not only the principal tourist attractions but also the interesting features of the lesser-known districts.' The book is well arranged, the chapters being devoted to the natural geographical divisions of the main river valleys and the coast. Each chapter thus forms a brief introduction to a compact and logically defined area. While sustained reading of the book leaves one feeling rather breathless, it also leaves one stimulated to explore the county on the spot, chapter by chapter, in a more thorough and leisurely way. Mr. Bolton is a photographer with an eye for pictorial effect, and the book is beautifully illustrated with sixty-eight of his own photographs. His interest in buildings is pictorial and literary rather than architectural, though, with scrupulous fairness, he tells us of the founding of Bradford Technical College as well as of Fountains Abbey. Fifteen pages are devoted to York, but the attractions of the industrial areas are also given their place. M.L.

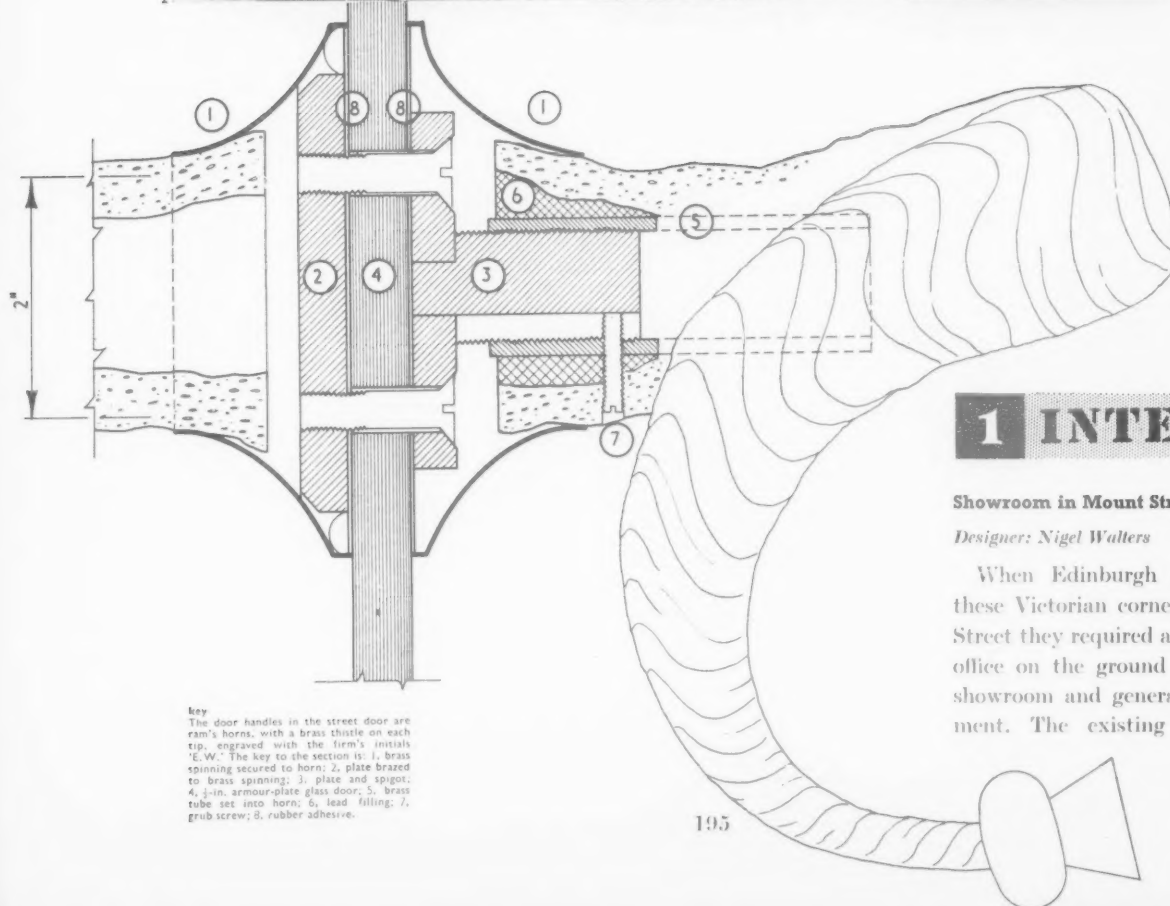


SKILL

A MONTHLY REVIEW

OF BUILDING TECHNIQUES & INDUSTRIAL DESIGN

- 1 interiors
- 2 design review
- 3 techniques
- 4 the industry



key
The door handles in the street door are ram's horns, with a brass thistle on each tip, engraved with the firm's initials "E.W.". The key to the section is: 1, brass spinning secured to horn; 2, plate brazed to brass spinning; 3, plate and spigot; 4, 2-in. armour-plate glass door; 5, brass tube set into horn; 6, lead filling; 7, grub screw; 8, rubber adhesive.

1 INTERIORS

Showroom in Mount Street, W.1.

Designer: Nigel Walters

When Edinburgh Weavers took over these Victorian corner premises in Mount Street they required a main showroom and office on the ground floor and a smaller showroom and general office in the basement. The existing matchboard walls,



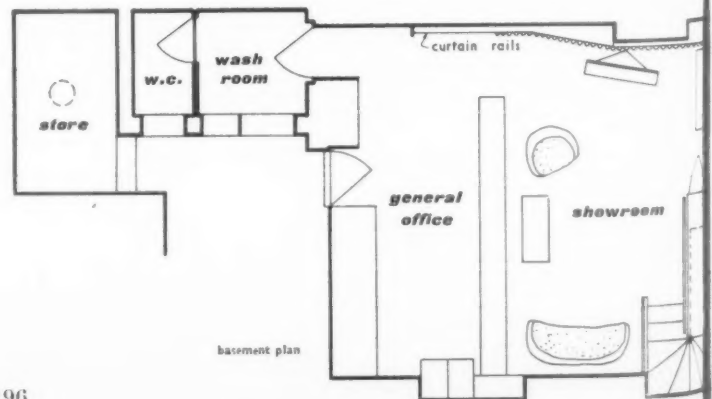
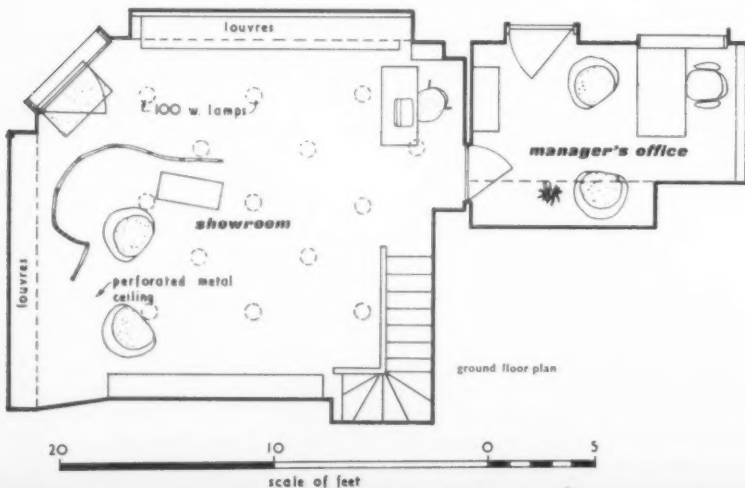
2, the designer's sketch of the exterior.

narrow staircase and haphazard arrangement of mouldings, recesses, pilasters and electrical conduits made many rearrangements necessary. The area in front, serving as fire-escape and repository for dustbins, which was visible from the showroom when the window-cill was lowered to floor level, was covered over by a tightly spaced grille and the railings were removed.

In the ground-floor rooms a false ceiling has been installed which accommodates strip lighting over the windows and spot lighting in the showroom. There is a steel mesh over the front window to which a bar can be hooked and draped with materials for display. The matchboarding has been replaced either by plain plastered walls or by striated pine plywood. On the ground floor, existing recessed cupboards have been refronted flush with the walls, with touch-latches. The walls and doorways are different shades of white, the ground floor ceiling is lavender and the basement ceiling dark green. The staircase is backed with mirrors and there are a teak handrail, white stove-enamelled uprights and decorative brass balusters. In the front window there is a movable screen of steel display ladders to which panels, faced with mirrors or painted, are attached. In the side window the emphasis is on the horizontal lines of a long storage chest which, together with all the furniture, is specially designed and of teak. The small tables and desk on the ground floor are topped with Macassar ebony. The carpet is charcoal grey Wilton.



3, entrance to showroom through wide armour-plate door, with ram's horn handles (see 1). Above entrance is wire mesh from which displays, draped over hooked rods, are suspended. The movable screen panels are wooden, with mirror on one side. 4, basement showroom; the high storage rack conceals a small general office. 5, basement with narrow stairway leading to ground floor, which is backed with mirrors; the wall surface on the left is striated plywood. 6, ground floor showroom, with manager's office beyond. The spotlights shine through a louvered ceiling, and the low storage cabinet in the window provides a horizontal emphasis, in contrast to the vertical one in the front window.



2 DESIGN REVIEW

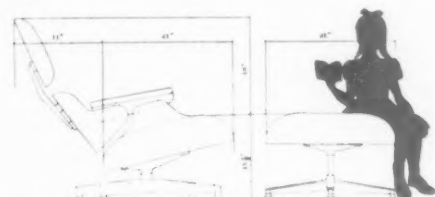
Lounge Chair by Eames

The new lounge chair and ottoman designed by Charles Eames for the Herman Miller Furniture Company, is one of the first pieces of twentieth-century furniture that aims to provide the standard of comfort considered a necessity by the average London club man. It is interesting that in his search for this kind of comfort the designer has returned to the use of feathers and down for stuffing; like few other materials, he

1 and 3 show the chair in position; 2, names the parts and materials. The wooden shells are moulded rosewood ply; the cushions have a core of foam rubber, topped by feathers and down; and can be covered in whatever material the customer wishes, leather being shown in 1 and 3. 1



UPHOLSTERED LOUNGE CHAIR AND OTTOMAN



BACK CUSHION
Identically constructed and are interchangeable. Nylon webbing supports to a reinforced fibre back. Nylon webbing supports to a reinforced fibre back. Cushions are secured to plywood with straps.

ARM
12 gauge formed steel plate. Upholstered with foam rubber bonded to the plate. Covered with fabric to match seat and back.

OTTOMAN & CHAIR SEAT CUSHIONS

Identically constructed and are interchangeable. Nylon webbing supports to a reinforced fibre back. Nylon webbing supports to a reinforced fibre back. Cushions are secured to plywood with straps.



OTTOMAN SHELL
Moulded plywood of laminated rosewood fibre veneers. Laminated plywood of laminated rosewood fibre veneers.

SPIDER

Cast aluminium with machine parts cast in. Reclines in two fixed bearings. First reclining is provided only a mechanical stop in the back. Flat steel plate bearing frame.

OTTOMAN BASE

Cast aluminium. Upholstered upper surface flat. Back frame plywood underlaid. Machine parts in plastic post assembly.

GLIDES

Stainless steel 100 lbs. cast.



UPHOLSTERY MATERIAL
Black leather. It made to order in Hongkong and (S.M.L.) exclusive with Herman Miller.

BACK SHEETS

Moulded plywood of laminated rosewood fibre veneers. Straps to secure back cushions.

BACK CONNECTIONS

Cast aluminium. Back frame. Upholstered with leather under surface.

BACK SPACERS

High strength laminated rubber.

ARM

12 gauge formed steel plate. Upholstered with foam rubber bonded to the plate. Covered with fabric to match seat and back.



SHOCK MOUNTS

Specialty designed for the lounge chair. Resilient neoprene shock mounts with inverted steel inserts.

SEAT SHELL

Moulded plywood of laminated rosewood fibre veneers. Laminated plywood of laminated rosewood fibre veneers.

SEAT BASE

Cast aluminium with polished upper surfaces and flat black baked enamel underside. Machine to receive bearings and post of spider.

CONNECTOR PLATE

12 gauge formed steel plate. Spring steel shell to back shell using shock mounts. Arm unit is attached to this plate.

PLAN VIEW SEAT BASE

11 1/2\"/>

2

Designed by Charles Eames for the Herman Miller Furniture Company

GLASS TABLE WARE

The examples shown here and on the three following pages are almost entirely without surface decoration. This is because the creative contribution to glass design in this century is the idea of setting off the form of the object simply by its own transparency. The glass designer's problem is to exploit transparency. The traditional method has been to define the transparent surface by faceting it to create a glitter. This method asserts the glass substance. The contemporary method emphasizes its apparent unsubstantiality. In doing so it conveys something of the fluid nature of the material. The light on the glass changes, but only at the speed of the viewer's eye. And so the impact of the design is gentle, suggesting the flow of water rather than the glitter of light. To illustrate this pleasing idea conveys no slight to the beauties and inimitable techniques of glass cutting.

Diana Rowntree

FINNISH 1, cocktail mixer and glass (sets of ten) in clear and coloured blown glass by Kay Franck, Finnmar.

1

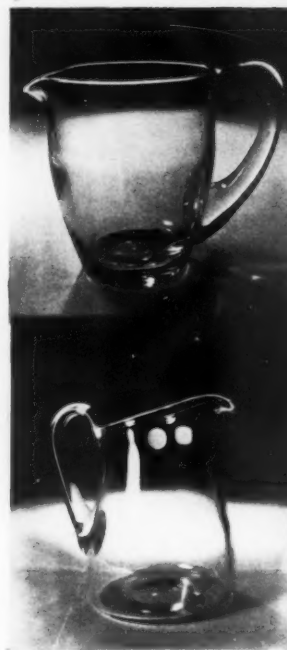
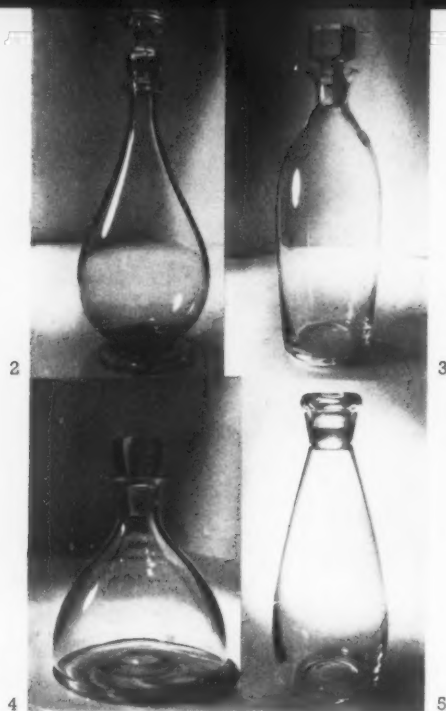


3

says, 'they give one the feeling of settling in and when you get up pop back into place as if you'd never been there.' The leather cushions

have built-in wrinkles 'a clue that spells comfort to come,' and as a further contribution to relaxation, 'all of the parts are allowed a bit of movement in relation to each other.'

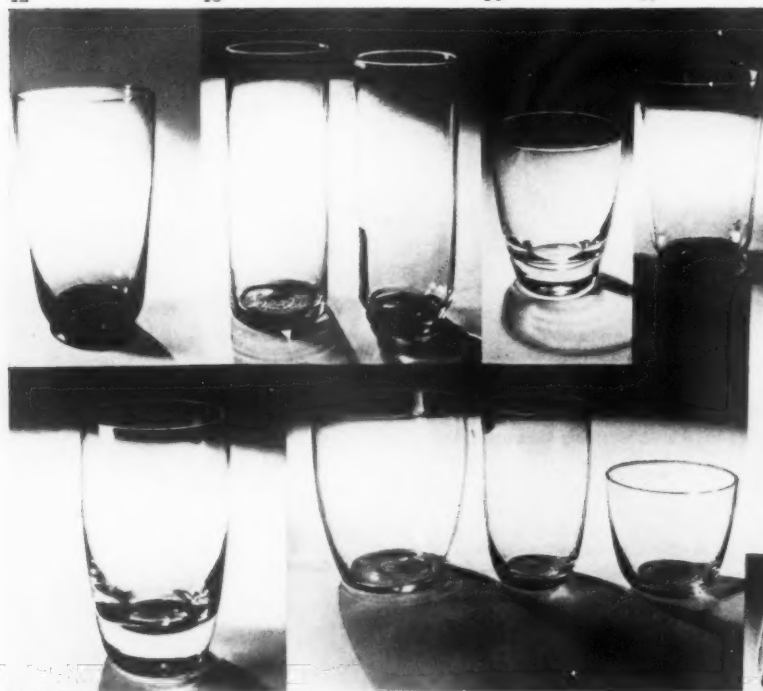




decanters SWEDISH 2, Orrefors sodaglass, Primavera, £3 0s. 0d.
 DUTCH 3, Leerdam bottle, Primavera, £2 15s. 6d.
 ENGLISH 4, Whitefriars crystal, Primavera, £2 3s. 6d.
 DUTCH 5, Leerdam bottle, £1 10s. 0d.

jugs SWEDISH 6, Orrefors jug from Harrods, £2 8s. 0d.

YUGOSLAV 7, ice jug, Harrods, £1 2s. 0d.
 DUTCH 8 and 9, Leerdam crystal jugs from Primavera, £3 18s. 0d. and £2 17s. 9d. respectively.
 ENGLISH 10, Whitefriars crystal, Primavera, £1 15s. 6d.
 SWEDISH 11, ice jug from Harrods, 13s. 0d.



tumblers ITALIAN 12, dark green patterned base, Heals, 6s. 6d.
 SWEDISH 13, tall tumbler from a water set designed by Stennett Willson. In neutral, smoke green or steel, Wuidart, Heals, £2 2s. 9d. the set; right, Stromberg, Heals, 10s. 6d.
 14, Orrefors, Heals, 9s. 6d. 15, Stromberg amber, Heals, 8s. 6d. 16, Orrefors, Harrods, $\frac{1}{4}$ pint 8s.; $\frac{1}{2}$ pint 12s.
 DANISH 17, Holmegaard in steel, Heals, 5s. 9d.
 DUTCH 18, Leerdam crystal tumbler at Primavera, £1 1s. 6d. 19, Leerdam at Primavera, half crystal. Tumbler



5s. 8d.; wine glass 4s. 3d.; fruit juice glass 3s. 9d.

tankards

ENGLISH 20, Whitefriars crystal, Primavera, both 4s. 2d.
 21, Whitefriars crystal, Primavera, $\frac{1}{2}$ pint 14s. 10d.; $\frac{1}{4}$ pint 11s. 9d. 22, Kosta, Heals, blue or crystal, 12s. 6d.

miscellaneous (right)

DUTCH 23, *Leerdam crystal pipe bowl at Primavera*, £1 11s. 6d.

SWEDISH 24, *Orrefors butter dishes at Primavera*, £2 5s. 6d., £2 14s. 6d.

ENGLISH 25, *Whitefriars finger bowl at Primavera*, 7s. 11d.

SWEDISH 26, *Stromberg pressed glass jar, Heals*, 19s. 6d. 27, *Orrefors butter dishes, Primavera*, £2 5s. 6d., £2 14s. 6d.

wine glasses (below)

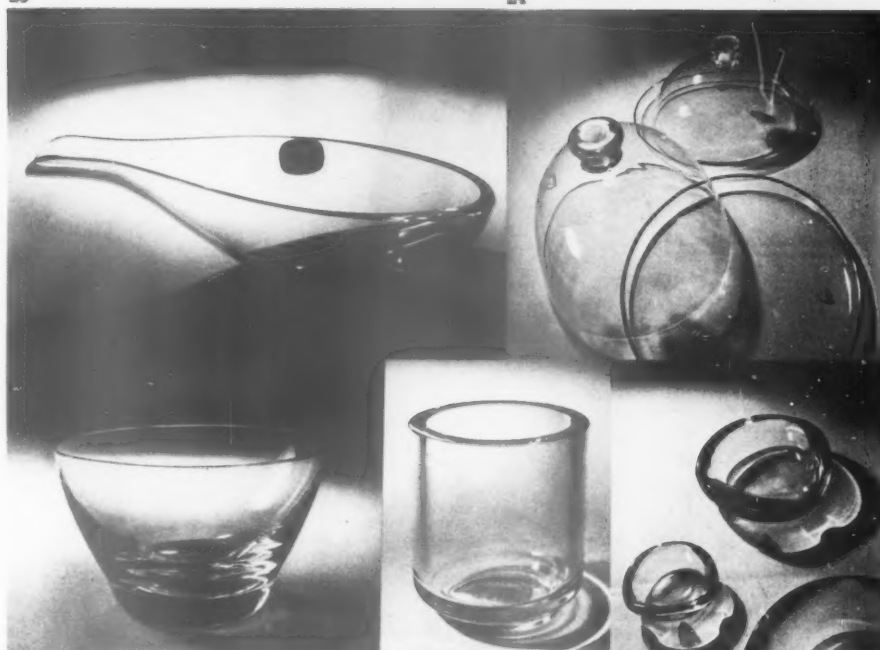
SWEDISH 28, *Stromberg heavy sherry, Heals*, 14s. 6d. 29, *Orrefors sodaglass, Primavera*, 6s. 9d., 5s. 6d., 4s. 3d.

DUTCH 30, *Leerdam crystal, Primavera*. A similar design: large water, 14s. 3d.; small water, 12s. 9d.; claret, 11s. 3d., 10s. 6d.; sherry, 9s.; liqueur, 7s. 6d.

ENGLISH 31, *Brierly claret glass, Heals*. 32, *Whitefriars crystal fruit juice glass at Primavera*, 3s. 8d.

SWEDISH 33, *Orrefors sodaglass, Primavera*, 6s., 5s., 4s. 3d. 34, *Orrefors claret glass, Harrods*, 3s. 9d.

ENGLISH 35, *Whitefriars crystal at Primavera*. Goblet, £1 6s. 3d.; whisky glass, 17s. 8d.



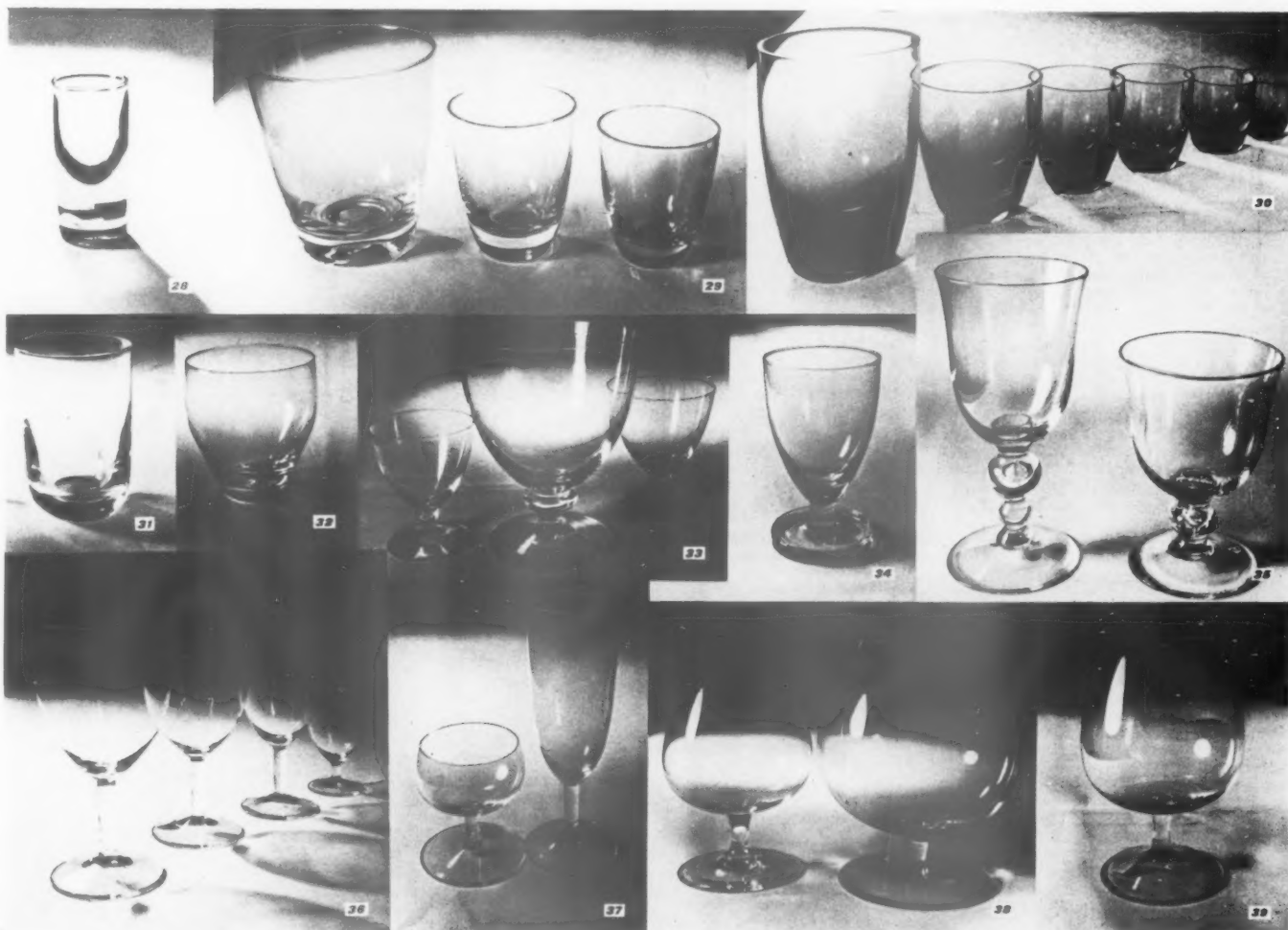
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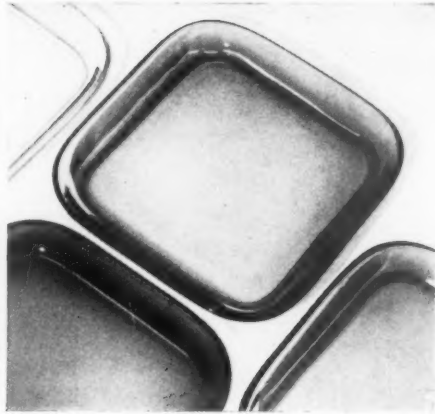
DUTCH 36, *Leerdam crystal set at Primavera*. Goblet, 12s. 6d.; wine, 8s. 9d.; sherry, 7s.; liqueur, 5s. 9d. 37, *Leerdam crystal at Primavera*. Cocktail, 8s. 3d.; champagne, 9s. 6d. 38, *Leerdam crystal at Primavera*. Large and small balloons, 13s. 6d. and 21s. 9d.

BELGIAN 39, *Belgian balloon at Primavera*, 10s. 6d.





40



41

miscellaneous

FINNISH 40, pressed glass in colours designed by Kay Franck for Wartsils-Koncernet. Marketed by Finnmar Limited. Plates 10s. 8d., and 5s. 2d.; jug, 19s. 2d.; glasses, 4s. 8d.; bowl, 5s. 2d. 41, square plates in pressed glass from the same factory. In assorted colours, 13s. 3d.

Cookers: Designing versus Styling

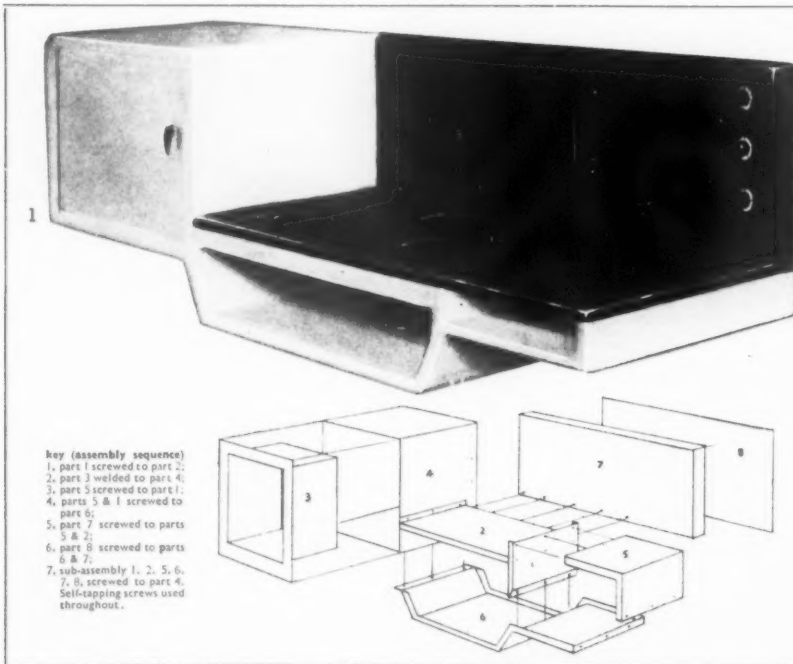
In proportion to the immense turnover in kitchen equipment, and the heavy-weight advertising necessary to draw attention to its labour-saving qualities, the amount of serious designing in this field is infinitesimal. Though the fashion points of cooker design change rapidly, and smartness would demand an annual change of all kitchen fittings from cream to white, and

back again, the basic cooker design for the mass market has hardly altered in a lifetime. It is therefore encouraging to find the Royal Society of Arts' Industrial Bursaries Competition producing an idea for a real improvement in domestic design, not simply a stylistic variation. Two students from the Central School of Arts and Crafts have tackled the problem of a wall cooker. W. D. Harbour's design brings the cooker

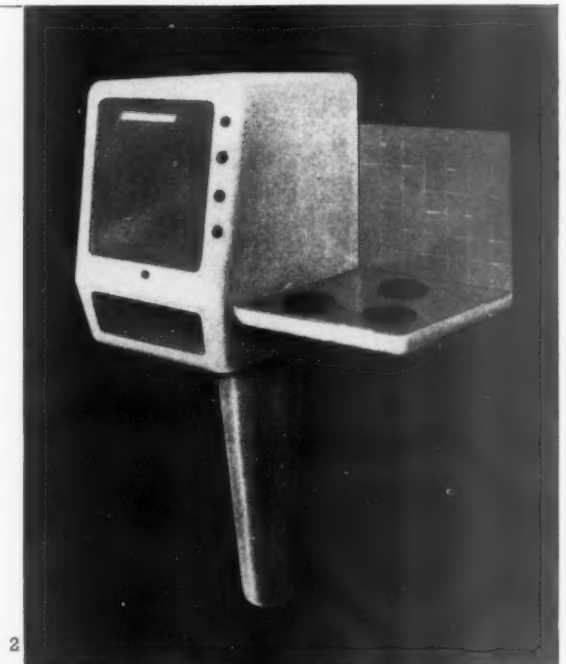
off the floor altogether. P. J. Collins' reduces floor support to a single column. The piece of floor under the cooker needs more frequent washing than any other in a house. Many of the available cookers have four legs raising them a few inches off the floor, though the recent trend is to take the casing right to the floor. This does away with the awkward space under the cooker but does not solve the problem of

spilling down the sides. It is hardly possible to make a perfect joint between a burner surface and the adjoining fitment. The wall cooker offers a real improvement by making this piece of floor accessible to light and cleaning, and removing the need to crouch and stoop over the oven. It is to be hoped that cooker manufacturers will ponder over Mr. Harbour's and Mr. Collins' ideas.

D.R.



1, design for a wall-mounted electric cooker, by W. D. Harbour.

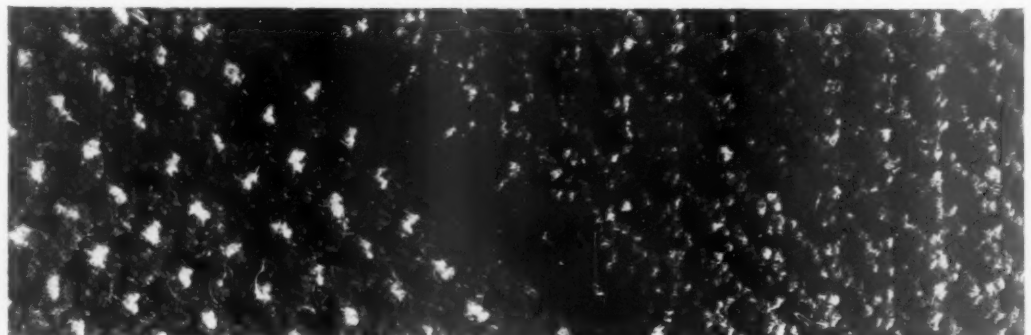


2, design for an electric cooker with adjustable base, by P. J. Collins.

Tweed Wilton

Tweed here is not a technical description nor an aesthetic falsity, simply a rough description of what this carpet pattern looks like. The pattern is in fact produced by using four colours in a pointilliste manner, and looks warm, rich, masculine and extremely useful. There are three colour schemes offered. No purpose is served by listing the component colours as the effects are subtle, and all in the green-brown category. The carpet is 27 in. wide and the price, 57s. 3d. per yard, includes tax. Right are two of the Tweed Wiltons on sale at Heals.

D.R.



3 TECHNIQUES

AIRCRAFT AND BUILDING

by Christopher Dawson

The most marked characteristic of the building industry (and of architects) over the last ten years is an awakening to developments in other technologies. While other (younger) manufacturing industries have made fruitful application of scientific knowledge, building, until the early 'thirties, continued to employ pre-industrial hand-craft methods—revealing a vulnerable self-sufficiency that was paralleled in the training of architects. But once scientific method made an entry, it only needed a period of austerity coupled with excessive demand—such as the post-war years—for the innate appropriateness of that method to our times to be realised. Hence the marked change in architectural style, the rapid increase in manufactured components, and, lagging a little behind, the rationalization of site methods.

But the sources of many of the detailed changes are to be found outside the building industry or the architectural profession: hence we thought it worth while to invite an engineer with extensive knowledge of the aircraft industry, Christopher Dawson, to tell us something about design and production methods and the administrative framework within which the aircraft industry operates. As the author points out, architects can probably learn more from aircraft manufacture than from any other manufacturing industry. Each aeroplane is 'custom built' in much the same sense that each building is specific to a particular client's needs. The proportion of hand craft to mass production in building probably approximates more to aircraft manufacture than to other engineering products such as motor cars. There is the third parallel that government agencies play a large part both as clients and as the promoters of research.

Where other interesting analogies with building occur in the story, an italic paragraph is inserted.

It may seem strange to describe for the benefit of architects, and so in a sense to hold up as an example, an industry which has been severely criticized in recent months. However, the aircraft industry is technically the most advanced of the engineering industries, for all its faults, and if there is anything which an architect can usefully learn from engineering, an aircraft firm is probably the one from which he can learn most.

The typical aircraft manufacturing firm is quite a large organization: some 20 aircraft constructors and about 6 aero-engine manufacturers between them employ a quarter of a million people. This does not include accessory or component manufacturers. It has been suggested that even so some of our smaller firms are not large enough to be able efficiently to initiate and complete the design and production of a modern aircraft. In the U.S.A. at least one firm has a payroll of over 60,000.

By contrast, the building industry numbers some 100,000 firms employing 1½ million men, but over three-quarters of the firms employ less than five men. This may reflect the low rate of capital investment, but it also reflects the wide dispersion of building works—as distinct from the immense capital and concentrated location of aircraft manufacture.

In relation to the size, the output from one firm looks very small, rarely (in peace time) more than a few score aircraft in one year. Against this the product, if a military aircraft, is judged essential to the country's safety, and if civil has immense earning capacity.

The first step in the conception of a particular aircraft type is the framing of the specification. For a military aircraft this is done by the Ministry of Supply to the requirements of the Air Ministry, or Admiralty in the case of naval aircraft. It is a very delicate process, as a balance has to be struck between the performance the service wants,

and the best that the state of technical knowledge at the time can produce. It is largely because of failures to achieve this balance that so many recent military aircraft have been disappointments. The Ministry must be in close touch with the thought of the leading designers so as to be able to advise the service as to what is possible. In the aircraft industry, more than anywhere else, the customer is always asking for performance or delivery dates just beyond the possible, and too often in recent years firms also have set their sights too high for their own capacity.

The drawing up of a civil aircraft specification is usually done by the principal operators, i.e., BOAC and BEA, the Ministry of Transport and Civil Aviation, with the Ministry of Supply, sitting as a committee. The machinery has been criticized in Parliament, and it does seem that better co-ordination of transport requirements is necessary.

The other main way of initiating a design is the launching of a 'private venture' aircraft. This simply means that the normal practice of manufacturing industry is followed: the manufacturers study a particular market, and get out a design for which they think there will be a demand, raising the necessary capital themselves. In the other cases the projects are financed by Government contracts. As firm orders are not usually placed at least until a prototype has flown, the investment needed can be very heavy, and private ventures are usually comparatively small aircraft.

Apart from the specification, requirements for military aircraft are laid down in general terms in Air Publication 970, *Design Requirements for Aeroplanes for the Royal Air Force and Royal Navy*. The equivalent for civil aircraft is the Air Registration Board's *British Civil Airworthiness Requirements*. The ARB is responsible for advising the Minister of Transport and Civil

Aviation on the granting of Certificates of Airworthiness, without which no civil aircraft may fly, and the B.C.A.R. are a guide to the considerations which govern such advice.

Once an aircraft specification has been drawn up it is issued to the firms likely to be interested, who submit designs in competition. One or more may be chosen, and a contract for further design work, and the construction of a prototype, awarded. Unless economy in production is specifically called for the successful design will be the most technically promising rather than the cheapest, and in any case firms will not normally quote a price until much later on in the development. Often two, or possibly more, designs are proceeded with as an insurance against unforeseen trouble with any one; the prediction of performance of high performance aircraft before lengthy evaluation in the air is often unreliable.

When a firm is presented with a specification it has probably already been making project studies of similar types for some time; most firms have teams working on such studies aside from whatever design work they may be doing. One of these may be suitable for adjusting to the specification. One of the main deciding factors in any design is the type of engine that is to be used. Engines are developed independently, and normally some time ahead of the aircraft which they will power. An engine is selected which will give the desired performance, and an assessment made of the space needed for it and the necessary fuel. This is most critical in the case of fighter aircraft, where the frontal area has to be reduced to a minimum, and the fuselage is usually closely moulded about the engine. An estimate is also made of the various weights: payload—the weight of passengers, freight, or military load it is required to carry—crew, engines, fuel, essential equipment, while their volume has also to be taken into account.

The influence of the engine in aircraft design seems analogous to the influence of a proprietary structural system in building.

It is usually wise to allow a weight growth factor, to allow for increases during developments as new equipment is called for. From these weights and volumes a beginning can be made on the design: knowing the weights, and allowing a percentage for the structure from experience, it is possible to settle the wing area. Wing loading, that is the weight supported by every square foot of projected area of the wing plan form, is chosen as a compromise between considerations of drag at high speeds, and performance at low speeds for landing and take-off. The external profile is then drawn out as a lines development plan in the same way as for ships: curves or contours are drawn which correspond to the intersection with the external surface of three sets of parallel planes in mutually perpendicular directions. Scale models can then be made and tested in wind tunnels to check and refine the aerodynamic design. Firms usually have their own small wind tunnels, but for larger models, which are desirable because they involve smaller corrections for scale effect (i.e., the fact that the flow of air over a small model is not exactly similar to that over the full-sized aircraft), and for performance ranges outside the capacity of their own tunnels they have to go to the Government establishments, or to the newly opened facilities of the Aircraft Research Association, a body owned co-operatively by fourteen firms in the industry.

Meanwhile structural design can begin. The aerodynamicists evaluate the loads involved in the most extreme manoeuvres the aircraft is likely to need to perform, and from these data the structural engineers can lay out the structure, and assess the sections and materials needed for the various members.

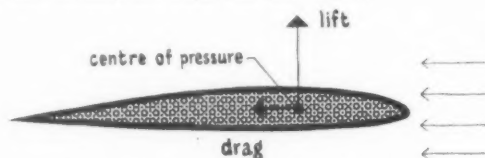
In straight and level flight the structure has only to redistribute the air loads so that they balance the aircraft's weight, 1 to 5. As soon as accelerations are imposed, as by manoeuvres, 8, or gusts, 9, the weight is in effect altered, and in some cases redistributed. The effect of this is to make it necessary to provide a structure which will withstand loads which are equivalent to the weight being multiplied by a factor n . A graph known as a flight envelope, 8 and 9, defines the limits of n at different air speeds. The values of n will be in the specification for military aircraft, and are laid down in B.C.A.R. for civil machines. The gust requirements are based on statistical surveys of the severity and frequency of gusts along operational routes.

The structural problem in aircraft is to provide the lightest possible structure which will withstand the imposed forces, while keeping within the geometrical limits of the airspeed contour. Stiffness is also very important as upon it depends suppression of the aeroelastic phenomena of flutter, divergence and control reversal. Reversal of control takes place when the loads set up by the operation of a control surface, such as an aileron, cause such distortion of the wing or other surface that the effect is to apply control in the opposite sense, 10. Flutter is an aerodynamically induced structural oscillation of a surface, either a main surface or a control, which may cause total failure in a very short space of time. It is similar to the oscillations of flexible structures such as suspension bridges in high

loads on an aircraft structure

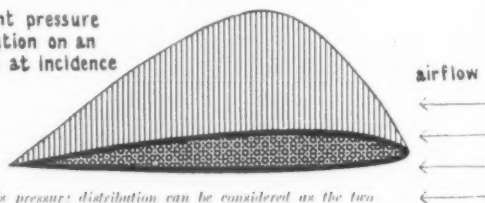


1, the aeroplane is a means of transport, a way of carrying things which inevitably have weight, from place to place.



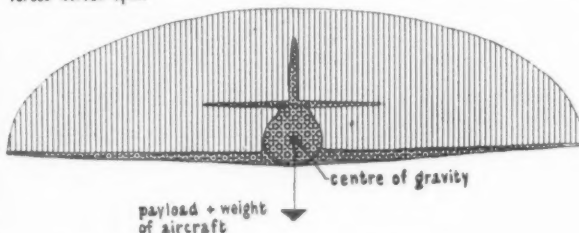
2, aerodynamics provides the force of lift by means of the pressure distribution on an aerofoil section.

resultant pressure distribution on an aerofoil at incidence



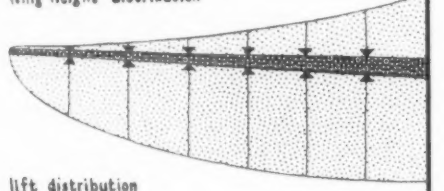
3, this pressure distribution can be considered as the two resultant forces normal and parallel to the airflow.

distribution of lift forces across span



4, it is the function of the aircraft structure to transmit the aerodynamic forces to support the payload.

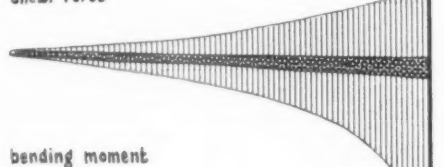
wing weight distribution



lift distribution

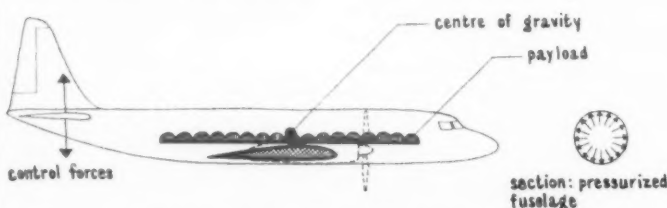
5, the most important structural part of an aeroplane is the wing, which can be thought of as a cantilever. In addition the movement of the centre of pressure, perhaps as a result of operating the aileron, imposes torques on the wing. . . .

shear force

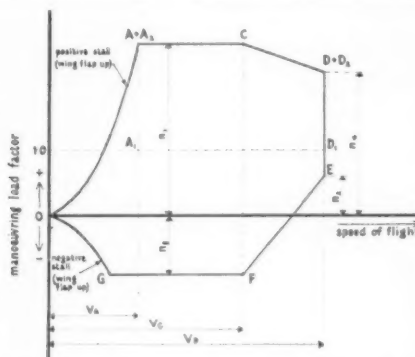


bending moment

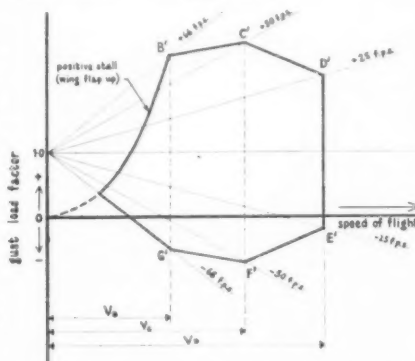
... In inverted flight the forces are of course reversed. The structure is designed to allow of this, but the maximum loading is taken to be less - see flight envelope.



6, the fuselage also acts as a beam, with the payload distributed along it, and control and trim forces applied at the tail in vertical and lateral directions. The fuselage structure weight acts in the same direction as the payload, i.e., downwards, so the more weight, such as fuel and engines, can be carried in the wing the less both wing and fuselage are loaded. 7, most fuselages are pressurized wholly or in part and so have to be designed as pressure vessels as well as beams.

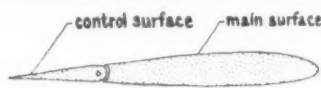


8, flight envelope (manoeuvring). This diagram lays down the loads which the aircraft must be able to withstand at various speeds. The origin gives the unloaded case (aircraft on the ground) and $n = 1$, the steady level flight case. Maximum loads are defined by the upper boundary (A, A₂, C, D, D₂) and minimum (inverted flight, etc.) by the lower boundary (G, F).

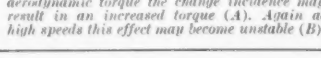
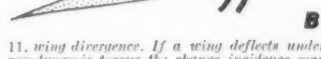
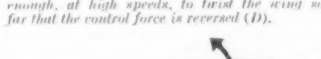
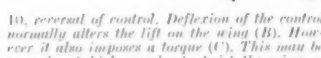
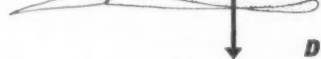
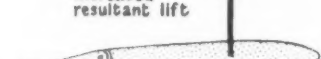


9, gust envelope. The diagram defining gust loads which the aircraft must withstand. The radiating broken lines correspond to different velocities of vertical gusts (from BCAR Section D).

aeroelastic phenomena



increased resultant lift



winds, and to the vibration which can be felt if a tape is held stretched in a breeze. Divergence is a deflection of a wing or other surface which is unstable, i.e., the deflection increases the force which initiated it, and in this way a wing can be twisted off, 11.

The main structural elements are the wings and fuselage, with the tail surfaces treated as smaller, and usually easier, cases of the wings. The wings are cantilevers, 5, which have to carry most of the weight of the aircraft, including the effective increase in weight in manoeuvres. Wings, particularly if swept back, also have to withstand large torsional moments, and so the most usual structure is a tapered box beam, 12, of which the upper and lower faces form part of the wing skin. Fuel, and often the engines, are carried in the wing: this weight distribution will reduce the wing root bending moment. See also 13 and 14.

The fuselage structure will normally consist of stiff frames, located on transverse sections, covered with skin which carries stiffeners, and probably a few heavier longitudinal members. In military aircraft some, and in passenger transports most, of the fuselage will form a pressure cabin, except for the few types which do not need to go to high altitude. This part of the structure has to be treated as a pressure vessel, 7, as well as a beam subject to varied loadings, 6, often difficult to predict, and is usually cylindrical in form.

Many of the structural elements in aircraft have to carry compression, and the selection of materials and forms which will remain stable and yet be as light as possible often involves complex designs, with a multiplicity of close-spaced stiffeners on a thin skin, 15-17. Light alloys

TABLE I

comparison of steel and aluminium alloy I-sections in bending,¹

	Steel ²	Aluminium Alloy ³
Section ...	4" x 11"	5" x 2 1/2"
Ix in. ⁴ ...	3.66	12
EI lb. in. ² ...	30 x 10 ⁶	10 x 10 ⁶
EI lb. in. ² ...	11 x 10 ⁷	12 x 10 ⁷
Weight per foot, lb. ...	5	3.56
Cost pence, per foot ...	3.54 ⁴	117.4 ⁵
Extreme fibre stress	547 M	208 M

¹ The ordinary engineer's theory of bending is assumed to apply.

² Data for steel from *Steel Construction Handbook* No. 22 (2nd edition, 1941), R. A. Skelton & Co. Ltd.

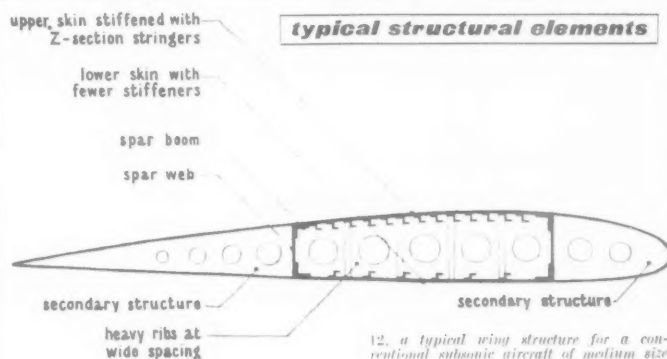
³ Data for aluminium alloy from *Structural Design in Aluminium* (1st edition, 1953), T. I. Aluminium Ltd.

⁴ At £33 per ton.

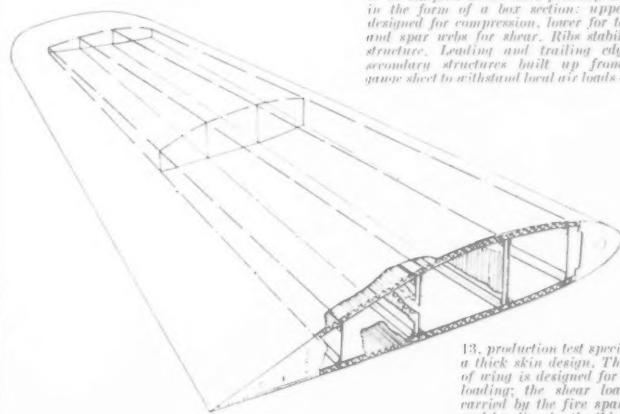
⁵ At 2s. 9d. per lb., representative of ordinary structural alloys; aircraft alloys would be more expensive than this.

are the conventional material: these have been developed to high tensile strengths (UTS considerably greater than that of mild steel for about one-third of the density). Although the elastic modulus of light alloy is about a third of that of steel a member designed to a given stiffness requirement will be lighter, although considerably more expensive, than an equivalent steel member. As an example Table I compares for approximately equal bending stiffness EI, steel and aluminium alloy I sections. The steel beam is 40 per cent heavier, but about three per cent of the cost of the aluminium. It will be seen that the strength of the aluminium beam is much greater than that of the steel; i.e., if the beams had been designed on a strength basis, as would be the case for many aircraft components, the aluminium one would have been much lighter still in comparison with

[continued on page 203]



12, a typical wing structure for a conventional subsonic aircraft of medium size at its simplest would have primary structure in the form of a box section: upper skin designed for compression, lower for tension, and spar webs for shear. Ribs stabilize the structure. Leading and trailing edges are secondary structures built up from light-gauge sheet to withstand local air loads only.



13, production test specimen of a thick skin design. This type of wing is designed for a high loading; the shear loads are carried by the five spar webs, and bending by the thick skin, which carries no stiffeners. The leading edge is lighter, and here thin gauge skin with bulb-angle stiffeners is used.

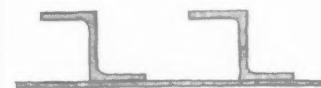


14, a sandwich skin wing of Handley Page design. Stiffness is obtained by the corrugated-core sandwich skins and webs. The multiple spars provide a measure of reserve strength in the event of a failure in flight. This type is analogous to 13 but is for lighter loading, as in transport aircraft. Fuel would be carried between the webs.

panel designs for compression



15, conventional sheet and stringer with rivets. Spot welding can also be used.



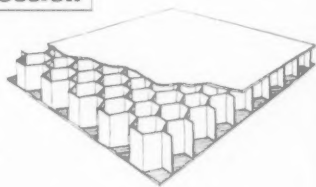
16, similar construction with stringers bonded with a synthetic resin adhesive (e.g., Redux) reduces stress-concentrations at rivets and reduces wrinkling between fastenings.



17, integral construction—skin and stiffeners machined from the solid slab.



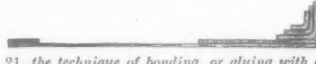
18, corrugated-core sandwich construction. Bonding, spot welding and riveting, including blind riveting, i.e., from one side only, can be used for building it up.



19, honeycomb-core sandwich. The honeycomb is made up from strips of aluminium foil a few thousandths thick bonded together with synthetic resin. The cover plates are also bonded on. Similar panels in stainless steel are built up by brazing.



20, another sandwich construction uses a core of selected balsa wood with the grain running perpendicular to the faces, which may be of light alloy or laminated plastic.



21, the technique of bonding, or gluing with a synthetic resin adhesive, makes possible the local reinforcement of sheet without recourse to integral machining.

steel for similar working stresses. Apart from considerations of temperature, and possibly fatigue, steel is only likely to be used for wing skins when the aerodynamic requirement is for a wing so thin and so highly loaded that an aluminium skin would be so thick in relation to the depth of the section that much of its metal would be too near the neutral axis to be effective in bending.

The lower density of light alloys is especially advantageous for compression members in that a thicker, lighter skin of equivalent tensile strength is more stable under compression than one made from denser material. This trend is carried further by the development of panel structures which are essentially cellular, 18-21. These constructions are also valuable in bending, particularly where rigidity is important.

On modern aircraft heating by the friction of the air at high speeds, and by proximity to the engines, makes necessary the development of materials which are both light and resistant to high temperatures. Stainless steel has been used, as it has high strength, but its high density makes compression members difficult to design. Titanium and its alloys are now being used in rapidly increasing quantities as they give strength at high temperatures similar to that of stainless steel for half the density. Its drawbacks are that it is not easy to machine, although much is being learnt about the working properties, and it is still expensive—raw titanium at present costs 21s. per lb. in this country, and alloys may cost much more. It is however a good example of a material for which the aircraft industry's need was such that it was produced, and methods of producing it developed, almost regardless of cost: ten years ago titanium metal was a laboratory curiosity of which only a few pounds existed, but it is now produced in thousands of tons annually.

Other materials being increasingly used in the aircraft industry are laminated plastics, phenolic, polyester and epoxy resins reinforced with glass fibre or long-fibre asbestos, but their low elastic modulus and slightly variable properties limit their use at present to secondary structure, that is structure which does not transmit the main loading but only has to stand up to the local forces.

In a modern transport aircraft the structure may represent as little as 25 per cent of the all-up weight. Taken in conjunction with the minimum value of n laid down by the ARB (2.5) this would mean that the structure is designed to carry 2.5/0.25, or 10 times its own weight, i.e., a dead/live ratio of 1/10. However the dead/live ratio as used in building design is perhaps not a strictly comparable quantity. The low structure weight is achieved by the use of the best possible materials, which are manufactured to strict specifications solely for aircraft use, and under rigid control; by structural analysis much more detailed than is common for any other types of engineering structure, and which does not accept the simplifying assumptions such as those which lead to the ordinary engineer's theory of bending; and by a severe programme of structural testing of components and complete aircraft. The factors of safety are also lower than is usual in general engineering work. Normal design factors as laid down by the ARB and in AP 970 are 1.5 on the ultimate tensile stress and 1.0 on the proof stress, the latter being the proportional limit of the material as determined by finding the stress which produces a

permanent extension of 0.1 per cent; it corresponds to the yield point for steel.

Despite the complexity of shape, and the very high degree of redundancy, methods have been developed for the analysis of aircraft structures which provide, at best, a knowledge of the actual load to failure within limits as close as the normal variation in material strength, itself strictly controlled by specification. These involve lengthy mathematical analysis, and it is becoming common, and will soon be essential, for electronic digital computers to be used in order to get out answers in a reasonable time.

The calculated strength of major aircraft components is checked by structural testing, often to destruction, and modifications are incorporated where necessary to bring the part up to the required strength, or to lighten it if this proves possible. There is a considerable body of opinion which favours the deliberate pruning of strength margins of ignorance, leaving it to tests to find weaknesses, in the interest of efficient structures.

This 'body of opinion' may be compared with criticism among some structural engineers of our use of working stress as the criterion in design. A committee of the ISE issued a report in May last year suggesting the use of an 'ultimate load factor'—a factor determined by reference not to yield point, but to the conditions and circumstances of the building's use.

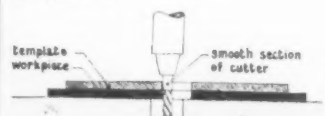
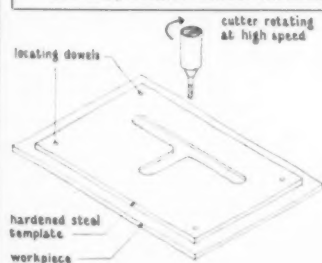
In detail design use can be made of data sheets published by the Royal Aeronautical Society, giving the stresses in the various parts of standard forms of structure, such as sheet stiffened by z-sections, for different loadings. Detail parts such as rivets and bolts are specified by the British Standards Institution, the Air Ministry, or in standard designs agreed by the Society of British Aircraft Constructors.

Structure is only one aspect of design. While it is being laid out a separate section will be assessing its suitability from the point of view of fatigue. Its weight will be accurately estimated by another section, while on completion further teams will calculate its vibration characteristics, and susceptibility to divergence, control reversal, and flutter. Other design operations are the detailing of engine installations, electrical, hydraulic, pneumatic air conditioning and pressurization systems. It is difficult to give any useful list of the number of different specialists in a design team as practice varies widely according to the size of the firm: a small firm will subcontract out some of the more specialized work. All firms will, however, have teams dealing with aerodynamics, structures, performance, aeroelasticity, weight analysis, systems and installations, production breakdown, flight testing and development work. A majority of the people in these teams will be engineers with some apprenticeship experience in the shops, and academic qualifications ranging from national certificates to first-class honours engineering degrees. A number of specialists, particularly aerodynamicists, mathematicians and physicists would come into the industry straight from their academic training, or from posts in other industries which employ the same specialists.

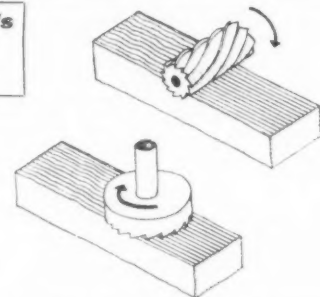
Organization within the firm again varies, but is generally in the form of a number of teams, more or less specialized, under leaders who meet at intervals at design conferences. These leaders are normally responsible to a chief designer, who is nowadays usually on the firm's

basic production methods

22, 23, machining
24-27, sheet-metal forming



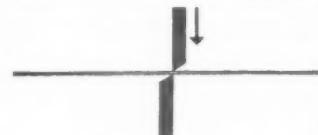
22, Router. (For irregular cut-out and profiles. A similar technique is applied to the manufacture of integrally stiffened slabs, cf. 15.)



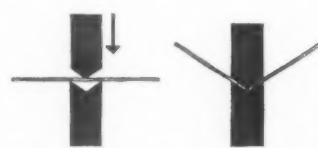
23, milling—the removal of metal by rotating cutters having a number of cutting edges.



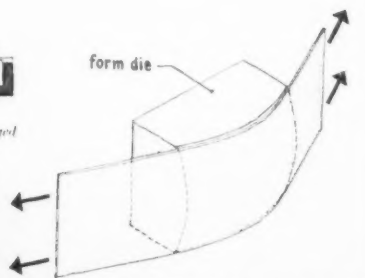
24, rubber bolster press (for making flanged holes and depressions in sheet).



25, guillotine shears (for cutting).

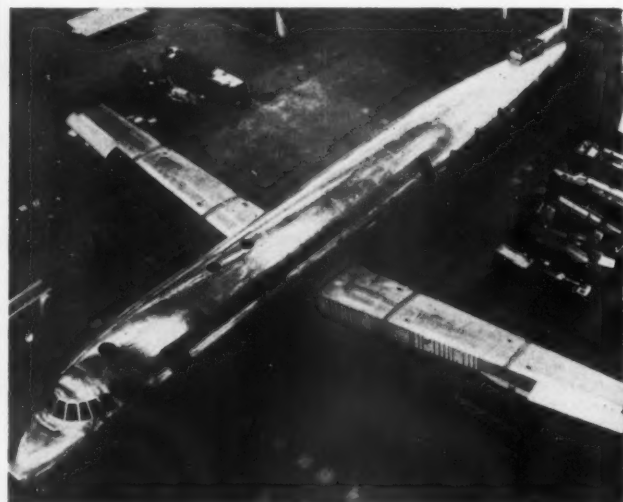


26, brake press (for bending).



27, stretch-press (Hufford). (For producing compound curvatures and various curved, jagged and twisted forms.)

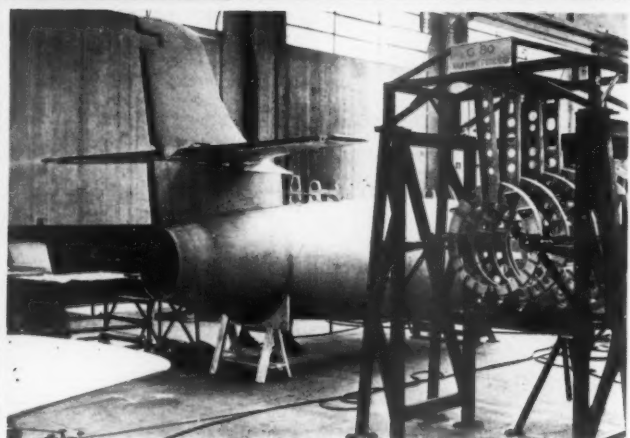
29



28



30



31

28, primary structure of the first prototype Bristol Britannia during construction. The inner wing spar boxes have two sections of leading edge attached at the ends. 29, the internal structure of a modern airliner's fuselage. The frames and skin stiffeners are in this case spot-welded. The heavy frames for the wing attachments can be seen in the foreground. The aircraft is the French S.N.C.A.S.E. Caravelle. 30, a small Hufford stretch-press at Handley Page Ltd. In this case corrugated honeycomb core is being formed round a die. A similar die on end can be seen in the foreground. The arms can be swung about a point under the die, and controlled tension applied to the workpiece by the hydraulic jacks on the arms. 31, a simple fuselage jig, with on the left the corresponding part of a nearly complete rear fuselage (Fiat, Italy).

board of directors. A complete design team will be quite large at least 100 on one aircraft unless it is small and simple. The design organization of a firm may be (and in practice those of the main firms are) approved by the ARB 'to furnish reports that the design of an aircraft complies with the Board's published Requirements. . . . A firm may be

approved for this purpose subject to compliance with the [following] conditions . . . ' (B.C.A.R. Section A). These conditions are that the Board satisfies itself that there is 'full and efficient co-ordination between the design office, the inspection department, the construction and the experimental shop,' that the qualifications of the staff are such that they

are 'adequate to conduct the work involved in establishing compliance with the Requirements, and shall be such as to ensure that good judgment is exercised with a full appreciation of current aeronautical practice.' It is also laid down that 'the staff shall include specialists qualified in all branches of aeronautics, in particular aerodynamics,

strength and stiffness, engine and other installations,' that 'the design office be so organized that all calculations on which the airworthiness of an aircraft depends are independently checked,' that 'the firm shall be able to call upon the services of a test pilot whose experience and qualifications are acceptable to the Board,' that 'the firm shall have facilities for making such tests as are necessary to establish compliance with the requirements, including facilities for structural and mechanical testing, flight testing, weighing, and determining the position of the centre of gravity of an aircraft,' that 'design records shall be such that proper correlation of drawings and amendments with the design records is ensured.' These requirements of course only cover civil aircraft, but there are more or less parallel provisions under the Air Inspection Directorate (MOS) for military machines. Both bodies reserve to themselves powers of inspection of all stages in design and production, and in practice there is a constant interchange of information, and copies of all drawings and calculations affecting airworthiness go to the Board for approval.

As early as possible the production development teams will be brought into the design to help decide on materials and manufacturing methods. As production approaches the design is broken down into production assemblies. Production drawings will number from 10,000 to 20,000 for a modern aircraft, according to size, and leaving out engines. Where sheet metal work is involved, and this still forms the greater part of an aircraft's structure, there is an increasing tendency to do final drawings full size on aluminium alloy sheets by a special technique which makes possible lithographic printing from these plates on to the production sheets, so avoiding laborious marking out by hand. As an alternative the full-sized plates may be reproduced by photographic enlarging from scaled-down drawings. The process of marking out the sheets so that when formed they will provide the required shape is known as lofting.

As soon as the design is far enough advanced the production people will start on jig and tool design, or this may be subcontracted.

The immense amount of work required to ensure structural suitability and safety of aircraft has brought about specialization—in the number of teams within the design group. Architecture seems to be on a similar path—at a less advanced stage—but with the marked difference that the separate specialist designers do not share a common basic training. It is interesting to note the distinction between the design team and the production development team; consultation between the two being 'often not as early as it should be'—this has a familiar ring!

The 'breaking down of design into production assemblies' also has its counterpart in recent experiments by individual architects to produce working drawings adapted to the sequence of operations on the site.

How full a set of tools and fixtures will actually be made depends on the number of aircraft it is immediately proposed to build. About this time a decision has to be made as to whether the aircraft is to be ordered into quantity production or not. The timing of this decision is very important. If it is too early the aircraft may prove unsatisfactory in development, and a large expenditure on production facilities wasted. If it is too late, valuable time may be lost in getting the aircraft into

[continued on page 206]

IN OFFICES

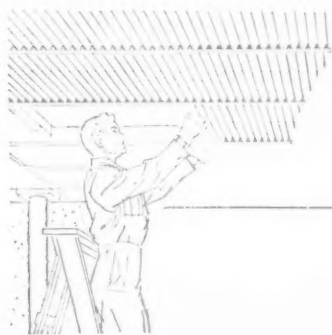


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production when the decision is made in its favour. Probably a conventional civil aircraft will be ordered about the time its prototype first flies, or earlier; advanced military aircraft may well need fuller evaluation in flight before a firm order can wisely be given.

The timing of the decision about quantity production suggests a parallel in the development of systems of construction by architect and manufacturer jointly. For example the Herts CC, in evolving the Hills system for schools, found that many of the difficulties and possibilities were only revealed in the course of putting up several buildings. Contractual arrangements and the terms of orders to the manufacturer allowed periodic modification. The great difference between the two cases is that while technical capabilities dominate in aircraft, economy dominates in building.

In any case aircraft production does not usually run to very large numbers: 100 a year for two or three years would be quite a substantial order for a modern fighter, and larger than would be likely for large aircraft, in this country. However, these numbers are sufficient to justify extensive tooling, whereas a prototype or research aircraft would be built with the minimum of tooling. This minimum is determined by the overriding importance of producing a job up to the very exacting standards of aircraft work: in general aircraft are designed to fulfil their function, a task difficult enough in itself, and only in comparatively minor matters can ease of production be allowed to dominate design. This is no reason, however, to reject production methods which are favourable to considerations of both manufacture and function.

Meanwhile work will have been

going ahead on the prototype. Much depends upon the development work which is done on this aircraft and the sooner it is available the better. Some of the tools needed for quantity production may well be made ready at the prototype stage, but in general the prototype will be largely hand built. The extent to which this is so will depend on how far the tooling is essential to the processes involved, and not economy of production. Often a second prototype will be put in hand soon after the beginning of the first, and it is now the policy of the MOS to order a development batch of up to twenty aircraft to reduce delays by making it possible to carry on different parts of the flight development work in parallel. A military prototype will be built to the MOS contract and be their property.

As the prototype nears completion the tempo of work increases. All departments are anxious to see the proof of the pudding. A heavy programme of testing on the ground and in flight is necessary, while a prototype in the air gives the public relations department something to write about; it is a tangible fruit of, probably, several years' work, but it means the job is no more than half completed.

The calculations of the vibration section must be checked by vibrating the aircraft in a number of resonant modes. This is usually done by supporting the airframe on vibrators which work on the same principle as a moving coil loudspeaker, and can be supplied from a variable frequency oscillator. The results have to be incorporated in the flutter calculations before flight at high speed is permitted. Here again the electronic computer is a powerful tool to speed up lengthy calculations.

The functioning of engines, all controls, systems and instruments will be subject to thorough testing on the ground before flight is allowed. The ARB will have to grant a certificate of airworthiness if it is a civil aircraft, and this will be for the prototype only.

After many delays and setbacks the first flight will take place. The company's chief test pilot will be in charge, and the flight will probably consist of a few circuits of the airfield at low speed, trying controls and checking performance. Intensive testing and development follow. The various design sections, particularly aerodynamics and aeroelasticity, will be following the results of the measurements of vibration response and performance, and clearing the aircraft for various increases in speed and loading. The flight test crew are required to fly at specified speeds, or through specified ranges of speed, while carrying out manoeuvres or setting test recording gear in operation. Instruments will be reading the various quantities representing performance, and these will be recorded by an automatic observer, which is essentially a cine-camera. Other quantities may be converted into electrical impulses and telemetered back to base by radio. Apart from such quantities as speed, engine r.p.m., control angles, rates of roll, etc., there will be vibration pick-ups at various points, and strain gauges attached to the main structural members. Large quantities of film record and other data will be analysed, as much as possible overnight, so that flying can proceed the next day. Computers and automatic readers are used wherever possible. It is during this period that the value of a development batch shows its advantage over one or two

prototypes. The time from the flight of the first prototype to the putting of production aircraft into service is not likely to be less than three years, because of the amount of development work, and because all firms in this country suffer a chronic shortage of staff for this work; there is a tendency for this period to increase as aircraft become more complex. The time from the first steps of design is likely to be twice this.

Assuming that the type has been ordered into production much has to be done before aircraft appear ready for service. Materials are ordered, and may be subject to delays in delivery. Tooling has to be subcontracted, or built within the firm, depending on the production methods chosen. Tools needed will include punch dies for the rubber bolster press, 22, router templates, 23, form dies for the Hufford or other stretch-press, 21. If new production processes are involved special-purpose machines may have to be ordered, or again made within the firm, as the machine tool industry is nowadays working to capacity. Techniques such as bonding, that is metal gluing, call for presses which can apply heat and pressure, both closely controlled, to the parts to be joined. Production techniques are illustrated in 22-31.

The firm will have a production planning department which will lay out the production line, with the flow of parts from one operation to the next. Time study and rate-fixing departments have to work out rates for piecework. Control of material and inspection of parts to see that they conform to the drawings is the responsibility of the ARB or AID approved inspection departments, whose staff will amount to about 12 to 15 per cent of the whole

[continued on page 208

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production team. The ARB requires all material to be colour coded to specification, and kept in bonded stores until required. Also the chief inspector must be responsible directly to the board of directors.

Most of the firms have limited production capacity, and a large production order may mean separate production lines being set up elsewhere, very likely at the works of a competitor, or the subcontracting of airframe parts to outside sheet metal workers. Specialized equipment such as the undercarriage, air conditioning and electrical equipment is also likely to be subcontracted, particularly by the smaller firms, but close consultation is maintained at all stages of the design and manufacture of such items. The assembly of the complete airframe, the installation of equipment, and the running of cables and pipe systems is usually done by the main firm, or at any rate by another aircraft constructor.

As the first production aircraft near completion final details of equipment will be settled with the operator, such as seating and interior trim of civil aircraft, radio equipment and crew accommodation. The operators of civil aircraft will have had opportunities to study and fly in the prototypes, and military prototypes are evaluated for the services by the Air and Armament Experimental Establishment at Boscombe Down.

When in full production aircraft are tested by the constructor, 32, and handed over to the operators, who will carry out their own tests before putting the machine into service. As no design ever reaches finality modifications are constantly being incorporated. These may be minor, such as an alteration to the mounting of some piece of equipment necessitated by the change to a more up-to-date type, or major, such as the increasing of the size of some

structural member which has been found in service to develop fatigue cracks. These modifications upset the production schedule, and may be considered important enough to be retrospective, so that aircraft completed earlier have to be modified, either in the operators' workshops, or by the manufacturer.

British aircraft are normally conceived in the first instance for the British operators, the services or civil corporations, but any successful aircraft is likely also to be sold abroad, and indeed production quantities would often be too small to be economic if this were not done. Generally the firm reaps the reward from these sales, although licence fees are paid to the Government for the use of work carried out under Ministry contract.

It may be asked what happens if an aircraft is found unsatisfactory and not put into production. In this case the contract is cancelled and the firm compensated for its work on a 'cost plus' basis, the margin allowed being 10 per cent, and the cost being that properly incurred in the fulfilment of the contract. The MOS has members of its staff in each factory doing work to Ministry contract, and they help to assess what work can fairly be charged to the contract if it is cancelled; they should be aware of time sheets and other costing apparatus involved. It is this procedure which enables firms to show a substantial profit even when they have had a failure with their current aircraft. It has been criticized on the grounds that it does nothing to encourage efficiency or economy, but some method of ensuring continuity of work in the industry, and of preventing dissipation of the talents of technical staff, is essential if the best use is to be made of the

facilities. Also few industrial concerns can take the financial risks involved in developing a large modern aircraft without outside aid.

The inherently uneconomic nature of experimental development of new products is a problem that aircraft and building probably share with all other industries. Individual manufacturers or the few builders who initiate new methods have to be quite sure they will recoup development costs on later sales. Individual clients—whether bodies such as the MOE or private people (and their architects)—are generally compelled to make sure that the 'prototype' is itself an economic proposition. But it should be remembered that the 'profitable failure' of the aircraft industry takes place in an environment sheltered from ordinary rigours of supply and demand.

The aircraft industry shares with the rest of engineering industry the practice of uniting the activities of conception, design, manufacture and sales under one board, and often under one roof, with the staff for each of these activities drawn from broadly the same sources, but differs from it in its immense reliance on Government research, and the extent to which the Government is its main customer. It is an industry which has become accustomed to the attitude that it is difficult enough to make an adequate product at any price, and that economy is a secondary consideration. However, as a result it has shown that the application of the results of fundamental research, in administration and production as well as in design, is of great value. It has also proved to be a great forcing house of ideas. But for pressure from the aircraft industry development of very high strength alloy steels, aluminium alloys, structural plastics,

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32. structural testing of the Bristol Britannia at Farnborough. The double exposure shows the amplitude of the working deflection. This particular test applies fluctuating wing loads to simulate the effect of gusts, while the fuselage pressure cabin is pressurized and released under water in the tank on the left, to represent the once-per-flight pressure loads. These tests are necessary because of the impossibility of predicting fatigue life reliably from theoretical considerations. (Crown copyright reserved.)



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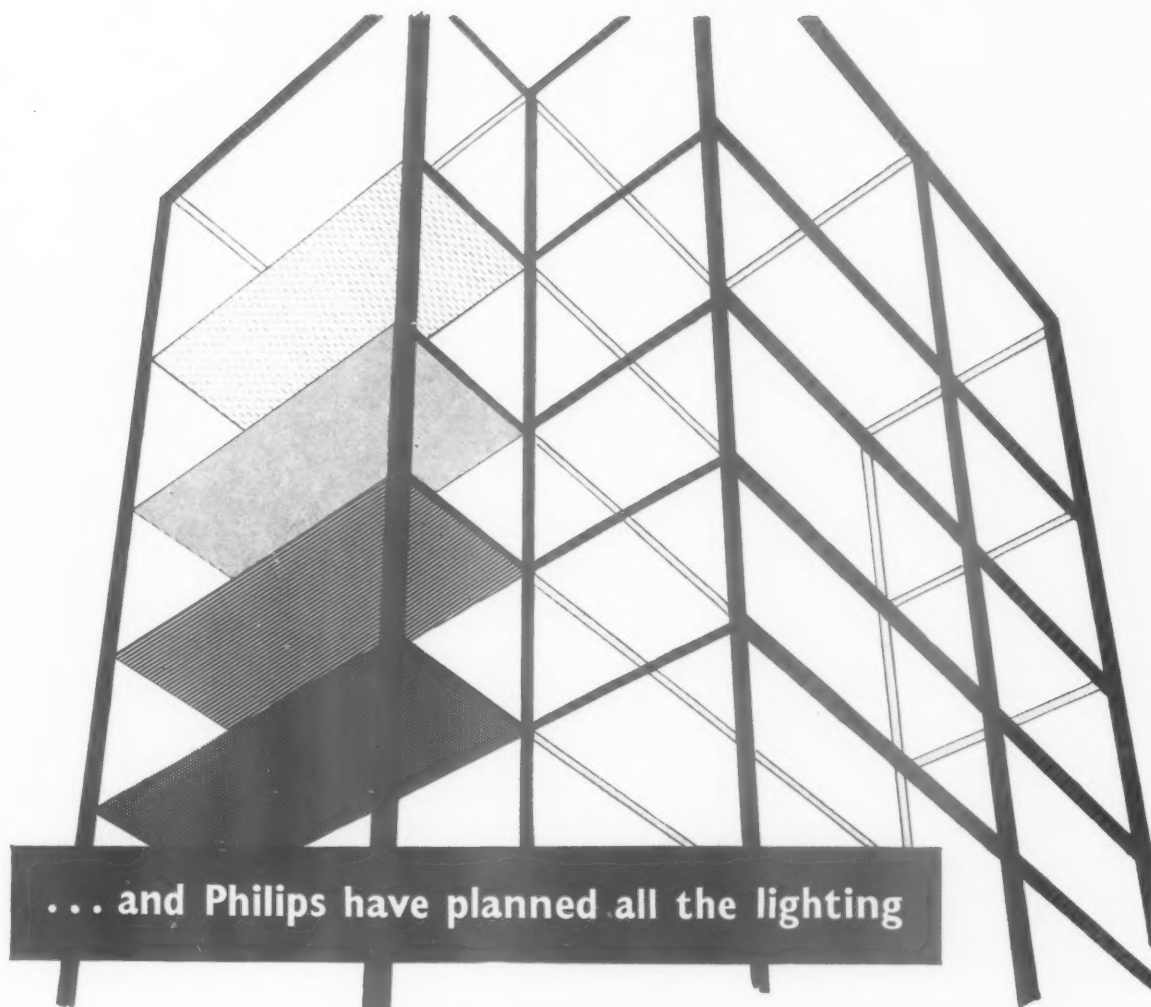
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synthetic glues, and many other materials and techniques would have been much slower.

The 'uniting of all activities under one roof' is a possibility that has only just appeared on the building horizon. The need for it is a direct consequence of increasing technical complexity. There is a parallel too in the extension of Government interest in building—as the major research body and, through the local authorities, as a major customer, setting space, performance and equipment standards which inevitably influence all building design.

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Sanitary Fittings, Ltd. Sliding door gear: P. C. Henderson, Ltd. Heating: Norris Warming Co. Heaters: C. A. Dunham & Co. Hardwood floor: Vigers Brothers Ltd. Wallpaper: Cole & Sons (Wallpapers) Ltd. Turfing: James Monk. Dry partitions: British Plasterboard Co. Gates, railings and balustrading: St. Peter's Metal Works. Tarmacadam: The Wainwright Paving & Contracting Co. Trees: Hillier & Sons. Acoustic tiles: Merchant Trading Co. Spherical concrete water tank: Cement Gun Co. (Gunite). External finish on tank: Gunac Co.

Offices in Chiswell Street, E.C.1. Architects: Handiside & Taylor, in association with Hammett and Norton. Clerk of works: M. Carding. General contractor: Bovis Ltd. Sub-contractors (structure): Asphalt tanking: Limmer & Trinidad Lake Asphalt Co. Asphalt roofs: H. V. Smith & Co. Leca blocks: Lightweight Precast Concrete Co. Reinforced concrete: Bovis Ltd.; Phillips Floors Ltd. Stone and stone-work: J. Bysouth Ltd. Slate panels: Setchell & Sons. Partitions: Internal Constructions Ltd. Lavatory partitions: Compactum Ltd. Glass fixer: James Clark & Eaton Ltd. Glass supplier: Pilkington Bros. Wood block flooring: Hollis Bros. Artificial stone: Girlings' Ferro-concrete Co. Structural steel erectors: Browns Erectors Ltd. Structural steel supplier: United Steel Structural Ltd. Waterproofing material: R. I. W. Products Ltd. Sub-contractors (equipment): Central heating: Regional Heating Co. Gas fixtures: William Sugg & Co. Gas fitting: North Thames Gas Board. Electric wiring and bells: City Electrical Co. Electric light fixtures: Courtney Pope (Elec.) Ltd.; Troughton & Young Ltd.; G.E.C.; Merchant Adventurers of London,

Ltd.; Falk Stadelmann & Co. Boilers: Ideal Boilers & Radiators Ltd. Stairtreads: R. Cattle Ltd. Metal staircases: Haskins Ltd. Plumbing: Subtrades Ltd.; F. Braby & Co. Lightning conductors: J. W. Gray & Son. Door furniture: G. & S. Allgood. Pavement lights: Lenscrete Ltd. Fire defence equipment: Merryweather & Sons. Telephones: G.P.O. Metal windows: W. E. Coffey & Sons. Window furniture: Teleflex Products, Ltd. Folding gates: Bolton Gate Co. Fireproof doors: Fireproof Shutter & Door Co. Sanitary fittings: Broads Manufacturing Co.; John Bolding & Sons. Staircase balustrade, railings, etc.: Haskins, Ltd. Linoleum flooring: Cellulin Flooring Co. Plaster and granolithic: Sydney F. Smith. Joinery: R. Cattle, Ltd.; Bovis, Ltd. Marble: Hopton-Wood Stone Firms, Ltd.; A. & F. Manuelle, Ltd.; Summers & Co. Textiles and furniture: Heal's Contracts, Ltd. Wallpaper: Cole & Son (Wallpapers) Ltd. Cement glaze: Robbs Cement Enamel Finishes, Ltd. Sun blinds: J. Avery & Co. Office fittings: Cooke's (Finsbury) Ltd. Lifts: J. & E. Hall, Ltd. Signs: The Lettering Centre. Paints: Leyland Paint & Varnish Co.; Inertol Co. False ceilings: Thermal & Acoustic Installations, Ltd.; Bovis, Ltd. Terrazzo: Art Pavements & Decorations, Ltd.; Alan Milne, Ltd.; St. James Tile Co.

House at Reigate. Architect: John R. Stammers. Quantity surveyor: Frederic Saunders. General contractors: H. Bacon & Son. Sub-contractors and suppliers: copper roofing: Frederick Braby & Co. Felt roofing: D. Anderson & Son. Electrical installation: W. G. Neale & Son. Wood block and cork tile flooring: Hollis Bros. Thermoplastic

tiles: Marley Tile Co. Second-hand stock bricks: Willment Bros. Foundation bricks: Uxbridge Flint Brick Co. Sliding windows: P. G. Allday & Co. Metal door frames: Henry Pipe & Sons. Standard windows: Mellor & Co. Weatherboarding: Joseph Handell & Co. Sanitary fittings: John Bolding & Sons; Stainless Steel Sink Co. Electrical heating: Panelco Ltd. Flush doors and kitchen cabinets: Jambor Joinery Ltd. Garage door: Watland Engineers Ltd. Special tiles: F. Beck Decorative Tile Co. Wallpapers: Cole & Son (Wallpapers); Arthur Sanderson & Sons; John Line & Sons. Paint: The Walpam Co.; Imperial Chemical Industries Ltd.; Cement Marketing Co. Lighting fittings: Merchant Adventurers of London Ltd.; Troughton & Young Ltd. and General Electric Co. Garden: Mechanised Gardening Ltd.

Showrooms in Mount Street, W.1. Designed under direction of Nigel Walters. Furniture and fittings: Andrew A. Pegram, Ltd. Painting and electrical work: Holland Hannen & Cubitts, Ltd. Windows: Crittall Manufacturing Co. Ship's lamps: J. Colombos & Sons. Dark grey carpet: S. J. Stockwell & Co. (Carpets). White rugs: Edinburgh Weavers, Ltd. Ram's horns: Charles Creswick. Standard lamp: Finnmar, Ltd.

Corrigendum

We regret that, through a setting error, one of the half-tone illustrations in the display advertisement of A. Davies & Co. (Shopfitters) Ltd., was printed upside down. The same advertisement appears, corrected on page ix of this issue.

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